CHANGE IS INEVITABLE
GROWTH IS INTENTIONAL

ANNUAL REPORT
2019 | 2020

saMRC
advancinglife

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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.

IN BRIEF

The SAMRC was established in 1969 to conduct and fund health research, health innovation, development and research translation. The SAMRC focuses on the top ten causes of mortality, co-morbidities, disability and associated risk factors. The scope of research includes laboratory investigations, pre-clinical and clinical research, and public health studies.

The SAMRC's research seeks to address South Africa's quadruple burden of disease: maternal, newborn and child health, HIV/AIDS and TB, non-communicable diseases and interpersonal violence. The SAMRC acquires the most accurate health information to inform policy and practice to improve the quality of life for the people in South Africa.

The SAMRC is the largest local funder of health research, medical diagnostics, medical devices, and therapeutics. To build human capacity in healthcare and ensure the sustainability of health research, the SAMRC has defined research capacity programmes, providing scholarships to Masters, PhDs and Postdoctoral scholars in medical and health sciences. As a custodian of health research, the SAMRC is building a healthy nation through research and innovation.

OUR VISION

Building a healthy nation through research and innovation.

OUR MISSION

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

OUR VALUES

Pioneering: By doing what was not done before, to achieve new results and solutions by finding new methods.

Collaborating: Combining our knowledge and skills to work together in achieving the same goal.

Excellence: A consistent action through work to improve from the current state. To always strive towards excellence by pushing harder and never giving up, and going beyond the requirement.

CONTENTS

A NOTE FROM THE BOARD CHAIRPERSON 4

A NOTE FROM THE PRESIDENT AND CEO 6

PART A:
ACHIEVEMENTS AND HIGHLIGHTS 10

Making impact through innovation and innovative approaches 11

Transforming strategic collaborations, partnerships & agreements 15

PART B:
PERFORMANCE INFORMATION 20

Statement of responsibility for performance for the year ended 31 March 2020 21

Strategic outcome oriented goals 22

Strategic objectives, performance indicators, planned targets and actual achievements 26

Our research profile 30

FUNDING HEALTH INNOVATION 36

Grants, innovation and product development 37

RESEARCH CAPACITY DEVELOPMENT 46

Building human capacity in health 47

SAMRC STRATEGIC RESEARCH PROGRAMMES 50

PROGRAMME 1: HEALTH PROMOTION & DISEASE PREVENTION 51

Purpose of the programme 51

Units that constitute this programme 51

Programme strategic objectives 51

Research highlights under this programme 52

PROGRAMME 2: MATERNAL, CHILD AND WOMENS'S HEALTH 74

Purpose of programme 74

Units that constitute this programme 74

Programme strategic objectives 74

Research highlights under this programme 75

PROGRAMME 3: HIV, AIDS, TB AND OTHER COMMUNICABLE DISEASES 85

Purpose of the programme 85

Units that constitute this programme 85

Programme strategic objectives 85

Research highlights under this programme 86

PROGRAMME 4: HEALTH SYSTEMS STRENGTHENING 112

Purpose of the programme 112

Units that constitute this programme 112

Programme strategic objectives 112

Research highlights under this programme 113

PROGRAMME 5: PUBLIC HEALTH INNOVATION 125

Purpose of the programme 125

Units that constitute this programme 125

Programme strategic objectives 125

Research highlights under this programme 126

PROGRAMME 6: BIOMEDICAL RESEARCH 135

Purpose of the programme 135

Units that constitute this programme 135

Programme strategic objectives 135

Research highlights under this programme 136

SAMRC COLLABORATING CENTRES & TB REPORT SA 152

COMMUNICATIONS AND STAKEHOLDER ENGAGEMENTS 154

PART C: GOVERNANCE 158

Introduction 159
Our board 160
Enterprise risk management 173

PART D: HUMAN RESOURCES MANAGEMENT 180

SAMRC organogram 181
Overview 182
HR priorities for the year under review 182
Employee performance management framework 182
Employee wellness programme 182
Achievements for the year under review 183
Challenges faced 183
Future HR plans and goals 183
Human resource oversight statistics 184
Guaranteed remuneration 184
Employment and vacancies 185
Job evaluation 186
Employment changes 187
Employment equity 188
Performance rewards 192
Foreign national workers 193
Leave utilization: 1 April 2019 to 31 March 2020 195
HIV and AIDS & health promotion programmes 197
Labour relations 198
Skills development 200
Injury on duty 201

PART E: FINANCIAL INFORMATION 202

Report of the Chief Executive Officer & President 205
Report of the Auditor General 206
Accounting Authority's responsibilities and approval 210
Audit Committee Report 211
Financials 213

LIST OF ABBREVIATIONS 275

CHANGE IS INEVITABLE
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A NOTE FROM THE BOARD CHAIRPERSON

Championing health research to advance life!

The SAMRC has been funding and conducting health research and medical innovation for 50 years since our formation in 1969. In the context of a world in transition with issues such as climate change, emerging and re-emerging epidemics and the rise of non-communicable diseases, we have to leverage leap-frog innovations, which the fourth industrial revolution (4IR), with its technological developments that maximise the interface between physical, digital and biological spheres, to address the diseases of South Africa, as we prepare for the next 50 years.

Globally, ill health is apparent: non-communicable diseases kill about 41 million people each year; the HIV epidemic is not under control with an estimated 1.7 million new HIV infections that occurred in 2018 worldwide; ongoing disease outbreaks, global warming and lack of equity remain a threat to human health. Against this backdrop, the SAMRC has led health research, innovation and development to improve the quality of life of people in South Africa.

The SAMRC has been responsive to our quadruple burden of disease by focusing on the top ten causes of mortality, co-morbidities, disability and associated risk factors. The South African Demographic Health Survey and Rapid Mortality Surveillance by the SAMRC have provided vital health data on mortality and cause-specific indicators since 2012.

The SAMRC is also proud about prioritising research translation and engaging a broad range of stakeholders to support their mission through institutional collaborations and partnerships with other countries.

As a responsive organisation, the SAMRC has performed despite the unfavourable fiscal climate, adopting an 80:20 principle of channelling most of its financial resources to its core business of conducting and funding health research and innovation while keeping its administrative costs below the target of 20% of its operating budget. The Board commends the Executive Management of the SAMRC for this achievement amidst a taxing economic climate.

Aligned with its Strategic Goal 4 of building capacity for the long-term sustainability of the country's health research, the SAMRC continues to build human capacity in healthcare through four defined research capacity development platforms. These include postgraduate development for health research skills, an early and mid-career investigator platform, institutional capacity development at historically disenfranchised tertiary institutions, and strategic partnerships and programmes for scarce skills. The Bongani Mayosi National Scholars Programme, one of the flagship programmes for research capacity development, has produced 47 graduates (87% of which are PhDs) in various health professions.

The SAMRC is also proud about prioritising research translation and engaging a broad range of stakeholders to support their mission through institutional collaborations and partnerships with other countries. Now in its 50th year, the SAMRC has emerged as a world-class research institution making an impact and supporting the National Department of Health in building a healthier and more productive country.

I wish to acknowledge the former SAMRC Board Chair, Professor Mike Sathekge, and members who served their term on the SAMRC Board under his leadership. I also thank the Executive Management of the SAMRC led by the President and CEO, Professor Glenda Gray, for their astute approach to the strategic management of the affairs of the SAMRC.

On behalf of the Board, we also thank the National Minister of Health, Dr Zwelini Mkhize, for his leadership and trust in how the affairs of the SAMRC are managed. A sincere word of gratitude to all the people of South Africa, partner institutions and collaborators for supporting the mission of the SAMRC.

I congratulate the SAMRC on reaching its 50th Anniversary milestone as we look to the future in championing health research to advance life.

Sincerely

PROFESSOR JOHNNY MAHLANGU
BOARD CHAIRPERSON

A NOTE FROM THE PRESIDENT AND CEO

A Transformed Organisation Impacting Global Health

The SAMRC reached a key milestone, our 50th Anniversary, a celebration of excellence in science that impacts the lives of the nation. This was a time to also reflect on what the past fifty years can teach us about research, how we have adapted and transformed into the medical research council of today, and what we can or must do in the future.

Transformation has remained an integral part of our strategy, driven at the highest levels within the SAMRC to achieve equity and diversity across the spectrum of job categories. The SAMRC has enabled effective monitoring and progress towards achieving our transformation goals, while also aligning our research priorities with funding flows. It is noteworthy that despite the constrained fiscal environment with funding for science, research and development, the SAMRC has prioritised its core business of health research and funding, curtailing our spend on administrative costs. It is noteworthy that the SAMRC has achieved clean audits in seven of the last eight financial years including 2019/20.

The Fourth Industrial (4IR) will impact on health in South Africa and the SAMRC is ensuring that we can optimize on the 4IR by creating a state-of-the art human genome sequencing facility, focusing on technological advances and diagnostics, precision medicine and drug safety, drug formulation and discovery, big data and bioinformatics, as well as regulatory, legal, responsible conduct of research and ethical processes for gene editing. The recently formed SAMRC-BGI Genomics Centre has sequenced six samples from two patients with recurrent TB, three breast cancer patients and one HIV resister.

As we reflect on the past 50 years of the SAMRC, we look forward to building the next generation of research leaders and ensuring the long-term sustainability of the country's health research to save lives.

From leading DNA research to informing policy and practice, the SAMRC conducted a five-year observational study documenting maternal treatment, pregnancy and infant outcomes in pregnant women with rifampicin-resistance (RR-TB). The study findings were presented at the World Health Organization (WHO) and included in the WHO guidelines on managing people with RR-TB. This achievement is indicative of impactful research addressing the problematic burden of TB in South Africa. Further achievements and highlights are included in subsequent sections of the Annual Report (see page 10).

As part of our 50th Anniversary, we collaborated with the South African Medical Journal (SAMJ) to publish fifteen peer reviewed articles, highlighting the ground-breaking research and innovation by our researchers and the impact of our work, both nationally and globally. We also led, in collaboration with the National Department of Health, a two-day Universal Health Coverage symposium attended by the National Department of Health, representatives from the SAMRC, health researchers, provincial health departments, international non-governmental organisations and frontline health workers. The objective is to build a bridge between the body of health systems researchers that conducts high quality research together with decision-makers in government, from the Minister of Health through to the provincial and institutional level leadership and management of the health system.

The Symposium helped to elucidate on aspects of the National Health Insurance system, the interplay between health systems design and health financing reforms, and managing budget cuts while maintaining quality at provincial level. The collective sentiment was that financial reforms can be tested under the current legislative framework.

As we reflect on the past 50 years of the SAMRC, we look forward to building the next generation of research leaders and ensuring the long-term sustainability of the country's health research to save lives. I am immensely grateful to our Executive Management, scientists, support staff, field workers, trial participants and the communities who support and believe in the work that we do.

We, as the SAMRC have also always shown a remarkable ability to be responsive to the current issues that affect the health of our citizens or health on our continent. We were responsive to the Ebola epidemic and funded scientists to study the molecular epidemiology of the Ebola Virus. With the recent advancement of COVID-19 into our country, we have rapidly allocated money to fund research of this epidemic. We have allocated funding for surveillance, for understanding the molecular epidemiology, as well as host shedding and will contribute to funding clinical research and the search for preventative and treatment options including investigating monoclonal antibodies.

Sincerely

PROFESSOR GLENDA E GRAY
PRESIDENT & CEO: SAMRC

A SPECIAL TRIBUTE - PROFESSOR GITA RAMJEE

We are deeply saddened by the passing of Professor Gita Ramjee, a world-renowned HIV scientist and researcher who has led ground-breaking work in HIV prevention.

We express our heartfelt condolences to the family, friends and colleagues of Professor Ramjee, who passed away in hospital because of health complications related to COVID-19. She returned from the United Kingdom and passed on at Umhlanga hospital on Tuesday 31 March 2020.

Professor Ramjee was a Chief Specialist Scientist and had been the Director of the HIV Prevention Research Unit (HPRU). She joined the SAMRC in 1996. Under her leadership at the SAMRC Professor Ramjee's KwaZulu-Natal based team hosted 5 of 20 HIV Vaccine Trial Network sites across the country as a part of a global scientific journey to find an effective HIV vaccine. The team is also testing a novel long acting injectable for the prevention of HIV in three communities across the greater Durban area.

"Gita was fundamental and inextricably linked to the endevours to find solutions to prevent HIV in women. She was tireless in this pursuit, her tenacity will never be forgotten," said Prof Glenda Gray SAMRC President and

CEO. "I have tremendous respect for her contributions and passion to find solutions for HIV prevention in South Africa, we have worked so hard towards this and are saddened to have lost someone so soon on this journey," added Gray.

Ramjee's passing is an enormous loss to the medical fraternity, she was a true trailblazer who has contributed substantially to HIV prevention research work in women globally and in South Africa among communities in the greater Durban region. Ramjee held Honorary Professorships at the London School of Hygiene and Tropical Medicine, University of Washington in Seattle and University of Cape Town. She specialised in integrated HIV prevention and treatment research and care programmes focusing on woman in KwaZulu-Natal.

She was the recipient of many national and international awards for her research including the Outstanding Female Scientist Award by the European Development Clinical Trials Partnerships (EDCTP) in Lisbon, Portugal, alongside other global academic giants. The Award was in recognition of her life's work and dedication to finding new HIV prevention methods, which are conducive to the lifestyles and circumstances of women in South Africa. She received the Lifetime Achievement Award at the International Microbicide Conference in Sydney, Australia in 2012 and the SAMRC Scientific Merit Award 2017 Gold Medal.

"A pioneer in the field of HIV prevention among high risk populations, Professor Ramjee's passing is a tragic loss. Her devotion and contribution in the field is known globally," said Professor Nana Poku, Vice-Chancellor and Principal of the University of KwaZulu-Natal (UKZN).

Ramjee a UKZN alumnus was a NIH funded Clinical Trials Unit Principal Investigator with a vast portfolio of phase I and II HIV prevention treatment clinical trials experience, she led HPRU's mission in uncovering the factors contributing to HIV infection vulnerability through extensive collaborations and prolific grant income generation of over a billion rand in her tenure at the SAMRC.

On behalf of the SAMRC Board and Executive Management Committee, we are saddened by the tragic loss of a well-respected scientist and esteemed colleague.

May her soul rest in peace.

Sincerely

PROFESSOR GLENDA E GRAY
PRESIDENT & CEO: SAMRC

TRIBUTES

Professor Gita Ramjee was a globally recognised pioneer for her ground-breaking research in the field of HIV prevention technologies for women. She was equally tireless in her advocacy efforts on the urgent need for women-initiated HIV prevention technologies best captured in her somewhat prescient words: "My calling is to find a solution. If I don't succeed in my lifetime, at least I've worked towards it."As we mourn her untimely passing and loss of a dear friend and colleague, let us remember her vision to find methods that empower women to take control of their HIV prevention and reproductive health rights through informed choices; build on her legacy, and make her dream a reality! ***Prof Quarraisha Abdool Karim, SAMRC Vice Board-Chairperson (2016-2019) , Friend and Colleague***

I have known Gita for 24 years… we were unit directors together for 19 of these years and I enjoyed her academic inputs at unit director meetings and when I would contact her for advice on HIV prevention. She was a co-investigator on my alcohol and HIV Flagship project which is still in the write up phase. She believed in doing science properly and knew how to run a good RCT and I remember her willingness to come and audit intramural units' data management procedures a number of years back and provide guidance on how we could improve our processes.
Prof Charles Parry, SAMRC Unit Director, Alcohol, Tobacco and Other Drugs Research Unit

Aurum is deeply saddened by the death of its Chief Scientific Officer Prof Gita Ramjee, world renowned for her tireless work to find HIV prevention solutions for women. A bold and compassionate leader in the response to HIV.
Gavin Churchyard, Group CEO, The Aurum Institute

We join the world in celebrating the life, the leadership, the courage and the bravery of one of our own. Gita Ramjee, a scientist, researcher, advocate and woman.
The Vaccine Advocacy Resource Group

PART A

Achievements and highlights

MAKING IMPACT THROUGH INNOVATION AND INNOVATIVE APPROACHES

A CENTRE IN AFRICA TO DECODE GENES

In July 2019, the SAMRC launched a Genomics Research Centre in partnership with the Beijing Genomics Institute. The goal of the centre is to conduct genomic research to address the growing disease burden of South Africa and build towards a future where the 4IR is a major component in African Healthcare. Since the launch, the team have been working on establishing the lab, research team, infrastructure, workflows and research strategies and to date have run more than 50 whole genome experiments. To complement this, the SAMRC and the Department of Science and Innovation have recently made a number of awards to address the topics of i) understanding the basis of treatment failure for non-communicable disease treatments in Africa and ii) set up a pilot project around HIV elite controllers where genetics are believed to be major contributing factors in disease management.

The SAMRC in collaboration with the Department of Science and Innovation has been driving the genomic and precision medicine initiative in South Africa. The SAMRC is the secretariat of the South African Precision Medicine Think Tank.

TRANSFORMATION IN SCIENCE

The SAMRC has transformed into a key institution of South Africa's democracy playing a crucial role in the country's future social and economic development. In response to the country's various disease burdens, seven new Extramural Units (EMUs) were launched – six of which are led by women who, over the years, made outstanding scientific contributions to advancing science and building the knowledge base in their respective disciplines.

Self-initiated research grants

Funding previously under resourced universities and addressing racial diversity in funding and gender parity. Through the competitive Self-Initiated Research (SIR) grants programme, more than 40% of funding was allocated to African people in 2018/19, with the bulk of awards in these priority areas: addressing the diabetes burden, innovative approaches to improve health, and understanding mental health. In addition, 54% of SIR grants were allocated to females and 46% to males in 2018/19.

Funding healthcare innovation

To improve the nation's health and quality of life, the SAMRC has emerged as the largest local funder of health research in Africa, with total revenue in 2018/19 of around R1 billion, of which about 49% is from baseline government grants and 46% from contract income. Approximately 44% of the total income is invested in external grants, innovation and capacity development, 40% in intramural research and 16% in core administrative support.

Health technologies have been developed and/or advanced by institutions and companies in South Africa through SAMRC funding that include diagnostics, health interventions, medical devices and therapeutics.

Strategic Health Innovation Partnerships and Grand Challenges Global Programme

Through the Strategic Health Innovation Partnerships (SHIP) Grand Challenges programme, we have partnered with the Bill and Melinda Gates Foundation's Grand Challenges in Canada, Brazil, India, Grand Challenges Africa and the US, to focus on maternal and child health – especially – the last trimester and the first 28 days after childbirth. We collaborated with the BMGF in our mutual interest of addressing the abnormally high mortality rate of babies and mothers in Africa who typically die through HIV, haemorrhage, infection and hypertension.

Grand Challenges South Africa

Grand Challenges South Africa was launched by the SAMRC, the South African Department of Science and Innovation (DSI) in partnership with the Bill and Melinda Gates Foundation to introduce joint challenges aimed at catalysing innovative health research within South Africa. Grand Challenges South Africa seeks to fund and support a diverse portfolio of multi-disciplinary collaborative projects aimed at developing and implementing multiple types of innovations. Linked to the SAMRC's strategic goal of supporting innovation and technology development to improve health, Grand Challenges South Africa works closely with Grand Challenges Africa and other Grand Challenges partners to nurture and strengthen the innovation ecosystem in Africa.

Healthy Life Trajectories Initiative

In September 2019, the SAMRC/Wits University Developmental Pathways for Health Research Unit started recruitment for a landmark international study to improve understanding of and address the mechanisms underlying child obesity. The Healthy Life Trajectories Initiative (HeLTI) involves research teams and funders from South Africa, Canada, India and China working together to test a package of interventions from pre-conception to early childhood to prevent obesity and associated metabolic disorders. The South African study is being supported by the South African Medical Research Council, partnering with the World Health Organization and the Canadian Institutes of Health Research. This initiative aims to generate evidence that will inform national policy and decision-making to combat child obesity.

Drug Discovery and Development

The SAMRC/UCT Drug Discovery and Development Research Unit is Africa's first integrated drug discovery platform H3D Centre that translates basic science knowledge into potential innovative new medicines for the treatment of malaria, tuberculosis and to combat antimicrobial resistance.

UMBIFlow

User-friendly portable continuous wave Doppler – UmbiFlow, reduced perinatal mortality rate in the study group by over 50% in Mamelodi, Tshwane. Results have culminated in a further nine research sites across South Africa.

BUILDING HUMAN CAPACITY IN HEALTHCARE

SAMRC received a R10 million boost to assist young South African scientists who are studying towards their PhDs in clinical and health research for the Bongani Mayosi National Health Scholars Programme from the Public Health Enhancement Fund.

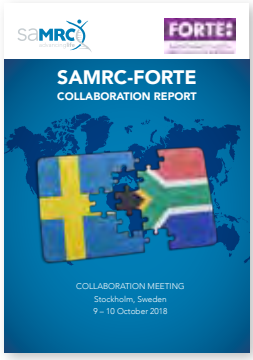
Three programmes were mutually agreed between the National Department of Health and the 22 private companies, who set up a vehicle called the joint PHEF (Public Health Enhancement Fund), which would fund the programmes. This programme includes the Bongani Mayosi National Health Scholars Programme (BM-NHSP), and is a partnership between the PHEF, the NDoH and the South African Medical Research Council (SAMRC). The SAMRC administers the BM-NHSP, the programme has produced 47 graduates (87% of which are PhDs) in various health professions.

COLLABORATIVE BIOMEDICAL RESEARCH PROGRAMME

The SAMRC and the US National Institutes of Health (NIH) embarked on Phase 2 of the programme of collaborative biomedical research over the next 5 years (2019-2024). The SAMRC is investing R45m p.a. (funding matched by the NIH) for projects in the areas of infectious diseases and non-communicable diseases. Eighteen projects will be funded in Phase 2 with all primary PIs in South Africa and Co-PIs in the US.

50 YEARS OF RESEARCH, INNOVATION AND DEVELOPMENT

The SAMRC celebrated its 50th anniversary in July 2019. To mark this important milestone, we organized three local and international conferences/symposia (12th African Rotavirus Symposium, SAMRC – Forte Symposium and UHC National Dialogue), published a supplement to the SAMJ Nov 2019 issue 50 years of ground breaking health research and innovation', held seminars, a gala dinner and awards evening and a number of staff events under the banner of the 50th anniversary.



Policy and Practice

Systematic Reviews:

The Health Systems Research Unit (HSRU) had two reviews that were included in the World Health Organization guidelines:

- Review of Health workers' perceptions and experiences of using mHealth technologies to deliver primary healthcare services: a qualitative evidence synthesis
- Review of Clients' perceptions and experiences of targeted digital communication accessible via mobile devices for reproductive, maternal, new-born, child, and adolescent health: a qualitative evidence synthesis

Bringing rigorous, trustworthy, and transparent qualitative evidence synthesis into the world of evidence-based decision making, is cutting edge, and these two reviews show that the HSRU is leading in this endeavour. More than ever, the physical distancing demands of COVID-19, will demand that we find the capacity to deliver health care in new ways, in ways that can be achieved remotely. The findings of these reviews recognize the promise of mHealth but suggest a measured approach in thinking through the practicalities of how this may be implemented.

Observational Study:

The SAMRC conducted a five-year observational study documenting maternal treatment, pregnancy and infant outcomes in pregnant women with rifampicin-resistance (RR-TB). The study findings were presented at the World Health Organization (WHO) and published in Clinical Infectious Disease and included in the WHO guidelines on managing people with RR-TB. This achievement is indicative of impactful research addressing the problematic burden of TB in South Africa.

DST/SAMRC SOUTH AFRICAN POPULATION RESEARCH INFRASTRUCTURE NETWORK

The SAMRC hosts SAPRIN, part of the Department of Science and Technology South African Research Infrastructure Roadmap, and the largest network of Health and Demographic Surveillance centres that monitor the health and socio-economic wellbeing of the South African population with the aim of improving their health.

SAPRIN together with the SAMRC recently released its first population dataset. The dataset monitors the health and wellbeing of people over time in order to gather new information about poorer South Africans. Responding to some of South Africa's biggest issues – including poverty, inequality, unemployment, and lack of access to effective health care – this is the first dataset to be released by SAPRIN since its inception in 2017.

NATIONAL TB PREVALENCE SURVEY

South Africa's first National tuberculosis (TB) prevalence survey was commissioned by the National Department of Health and aimed to determine the bacteriological or laboratory confirmed prevalence of TB disease in South Africa by enrolling an estimated 55 000 participants. Data collection was systematically done in 110 clusters across all nine provinces having commenced in KwaZulu-Natal in August 2017 and scheduled to conclude in Gauteng in November 2018.

"The TB prevalence survey that covers the whole country is long overdue. The survey will not only provide an estimate of South Africa's true TB burden, but it will also provide invaluable information to strengthen South Africa's response needed to Stop and End TB in our life time", said Dr Yogan Pillay, Acting Director-General: HIV/AIDS, TB, MCWH at the National Department of Health.

Key messages and findings:

- The first national TB Prevalence Survey to investigate/understand TB incidence and prevalence estimates in South Africa
- The Survey assessed the health care seeking practices among people with signs and symptoms of TB
- The sample size was 55 000 and age cohort of participants was 15 years and above, participation was low among the youth and male cohorts than females
- South Africa has a high burden of TB, accounting for 3% of cases worldwide
- South Africa faces four colliding epidemics, maternal, new-born and child health, tuberculosis and HIV/AIDS, non-communicable diseases and injury and violence
- TB awareness and health promotion messages are critical to tackle the burden of disease
- Low socio-economic status and, HIV co-infection are driving the epidemic

The strength of the Survey is that it provides current and very detailed information to the National TB Control Programme on how to design interventions to target the health needs of the different genders, age groups and other high-risk populations.

Key survey findings:

- TB prevalence 852 per 100,000 population, men 1.6 times higher prevalence - adjusted prevalence (including children and extrapulmonary TB) was 736 per 100 000 however there is a need for more representativity
- Age group 15-24 had the lowest prevalence, this is in contrast to HIV were the age group has a higher risk of infection
- Pathways to care for health seeking behaviour indicate a need for awareness and looking at other ways to reach men and the youth, i.e. partner with youth organisations, use mass communication tools such as social media, and including TB services in men's health programmes
- Survey data reaffirms research findings on TB, while necessitating the need for further research and follow-up surveys every five years to trace the trend

Centre for Antimicrobial Resistance

Established the Centre for the Study of Antimicrobial Resistance (CAMRA) at the University of Cape Town in response to the emerging antimicrobial resistance (AMR) crisis. The Centre consists of a multi-disciplinary team of national and international experts focused on addressing specific aspects of bacterial multi-drug resistant pathogens, including tuberculosis.

Rapid Mortality Surveillance

The SAMRC's Rapid Mortality Surveillance has been providing empirical estimates of the mortality-based high-level indicators for monitoring health and the performance of the Department of Health since 2012. It provides information to track Outputs 1 and 2 of the health-related targets of the Negotiated Service Delivery Agreement (NSDA) and health-related targets of the Medium-Term Strategic Framework (MTSF). Highlights of the 2018 report include:

- the average life expectancy in South Africa is now over 64.8 years, having increased by more than 10 years since the low of 53.7 in 2005. The increase in life expectancy is due particularly to the decrease in child mortality as well as young adult mortality and reflects that the 2019 target of 64.2 years has been met.
- life expectancy at age 60, a useful indicator of the mortality experienced by older South Africans. In 2018, the life expectancy at age 60 is 19.6 years for females and 15.9 years for males with an overall average of 17.9 years.
- Infant and under-five mortality rates reached a low of 23 and 32 per 1 000 live births in 2017 but increased to 25 and 34 per 1 000 livebirths in 2018, respectively. This appears, from the NPR data for 2017, to be due to an absence of the winter increase generally associated with pneumonia and diarrhoea among infants 1-11 months old.

Tackling childhood TB

New agreement with the Foundation for Innovative New Diagnostics (FIND) to support diagnostic innovation for childhood tuberculosis (TB) in South Africa. The project is part of a global effort to improve childhood TB diagnosis, guide paediatric treatment, and reduce suffering, disease transmission and deaths from TB in babies and children.

What Works Global Programme

Over the last two decades, the global community has come to recognise the profound impact of violence on the lives of women and girls. This fundamentally undermines their health and well-being and stands as a barrier to women's full participation in global development and the economic and civic life of their communities. The UKAID-funded, What Works to Prevent Violence Against Women and Girls (What Works) programme, a £25-million investment in VAWG prevention managed by the SAMRC has now concluded. The Flagship reports are available with information on what we have learnt from six years of research across 13 countries on what works to prevent violence and galvanise a more effective, scaled-up global response.

- https://whatworks.co.za/resources/film-and-audio/item/668-video-violence-is-preventable-what-works
- https://whatworks.co.za/documents/publications/373-intervention-report19-02-20
- https://whatworks.co.za/documents/publications/374-evidence-reviewfweb

Commonwealth Health Report 2020

The SAMRC was featured in the Commonwealth Health Report 2020 on Achieving Universal Health Coverage in South Africa. The publication comes at a time when health is in the headlines across the world. Novel Coronavirus (COVID-19) has been declared a global health emergency by the WHO and is putting huge pressure on countries' health services and reinforces the need to build stronger health systems for universal health coverage.

It is also a stark reminder of the importance of international collaboration, political commitment and knowledge sharing – to deal not only with health emergencies, but to increase life expectancy, reduce maternal and child mortality, fight against leading communicable diseases and address the growing burden of non-communicable diseases.

Full report: https://www.samrc.ac.za/Media/CommonwealthHealthReport2020.pdf

TRANSFORMING STRATEGIC COLLABORATIONS, PARTNERSHIPS & AGREEMENTS

SAMRC and Beijing Genomics Institute

The establishment of the SAMRC Genomics Centre has closed a niche infrastructure gap for South Africa. The centre was officially opened in July 2019 and boasts the capacity and infrastructure to perform cost effective Whole Human Genome sequencing, with the latest in Next Generation Sequencing technology from the BGI-Shenzhen. The centre is a national platform and has already commenced in scaling up its activity to establish its sequencing workflow. We have incorporated an accelerator server to also process the large volumes of sequencing data and storage capacity at the SAMRC. A state-of-the-art laboratory management system has also been implemented to gear the centre towards larger volumes of sample processing.

The collaborative project with SAMRC's sister lab KwaZulu-Natal Research and Innovation Sequencing Platform (KRISP), has provided the necessary scenarios to gear the workflow toward scalability and a training ground for the centre's recently recruited core scientists. Soon the centre will have the necessary skills and capability to execute an efficient workflow and drive the accreditation process towards creating the best practice standards for whole genome sequencing. This will help the SAMRC in its vision to build capacity for the 4th industrial revolution as the scalability of genome sequencing increases, we will increase training and development of data driven science within the SAMRC and in partnership with the omics network within the country.

SAMRC, Novartis, and Department of Science and Technology

In 2017 the SAMRC, Novartis and the DST entered a MoU. Under the MoU the parties agreed to conduct research joint projects and capacity development initiatives. The flagship programme was a grant writing workshop. The first workshop was held in December 2017, with the second workshop was held in November 2018. More than 50 post graduate students from Historically Disadvantaged institutions were trained in how to write grants, budget, manage IP and prepare reports. GIPD offered three awards to the best proposals from the first workshop – these were awarded to Ms Asive Myataza, Ms Hlengwa Nokulunga and Ms Sangweni Nonhlakanipho. In September 2018, Hlengwa won the best PhD Presenter Award at the BRIP Annual Research Symposium and in January 2020 she has been appointed into a lecturer's position Dept of Biochem & Microbiology, University of Zululand

Ms Asive Myataza

Ms Nokulunga Hlengwa

Ms Nonhlakanipho Sangweni

THE COCHRANE NETWORK OF AUTHORS

Cochrane African Network (CAN)

- A network with a vision to increase the use of best evidence to inform healthcare decision making in sub-Saharan Africa.
- This is a global and independent network of researchers, professionals, patients, carers and people interested in health.
- Systematic reviews are produced to summarise and offer the best available evidence for different audiences.
- This evidence is informed by guideline developers and health care decisions makers worldwide.

Global Alliance for Chronic Disease

- Global Alliance for Chronic Disease (GACD) is a collaboration between the world's largest public medical and health funding agencies representing more than 80% of the world's funding for medical research to address chronic, non-communicable diseases in low and middle-income countries.
- GACD focuses on hypertension, diabetes, heart disease, mental illnesses, cancer, and lung diseases
- GACD funded research aims to contribute to the area of implementation science and address the significant knowledge gap between interventions that research has shown to be effective, and their delivery to communities and translation into practice.
- Each year the GACD holds Implementation Science Workshops as part of its capacity-building mandate. This is to address the increasing demand for training of Implementation Science researchers.
- The GACD and SAMRC joint Implementation Science Research call was to support research associated with the scale-up of interventions for the prevention, or detection and management of hypertension and/or diabetes in low- and middle-income countries and/or in vulnerable populations in high income countries. The research will be executed over 40 countries across the globe and represents USD 50 million of research funding investment over 3-5 years.
- The current GACD call focuses on implementation research for the primary and/or secondary prevention of cancer.
- Professor Glenda Gray, President & CEO of the SAMRC Chaired the GACD Board from 2016-2018 and is currently an executive member of the GACD Strategic Board.

SPOTLIGHT – The South African AIDS Vaccine Initiative

While the South African AIDS Vaccine Initiative (SAAVI) is no longer active in its original form, the SAMRC continues to receive funding from the National Department of Health for SAAVI. This funding is used for a variety of activities that complement and contribute to the broader GIPD HIV Programme and capacity development initiatives. These include projects focused on research capacity development, participation in global partnerships and various strategic projects.

During 2019/20, SAAVI funding contributed to two global HIV initiatives, the Evidence for Contraceptive options and HIV Outcomes (ECHO) trial, and the Pox Protein Public Private Partnership (P5), which led the HVTN 702 HIV vaccine trial and other associated trials. The ECHO trial was completed in 2019 and the results were published in the Lancet in June 2019, demonstrating no substantial difference in HIV risk among three different contraceptive methods evaluated. The trial further showed that all methods were safe and highly effective, supporting continued and increased access to these three contraceptive methods. SAAVI funding was used predominantly for community engagement activities on the trial in South Africa. The HVTN 702 HIV vaccine trial was unfortunately halted prematurely in early 2020; however, it will result in a substantial increase in our understanding of immune responses to vaccination. The SAAVI funds contributed in 2019 to defining the innate serum cytokine response to vaccination in the HVTN 107 P5 HIV vaccine trial, which looked at different adjuvants with the ALVAC and HIV Clade C Envelope protein vaccine candidates. SAAVI funds were also instrumental in the provision of PrEP to participants of the P5 and other HIV prevention trials in South Africa.

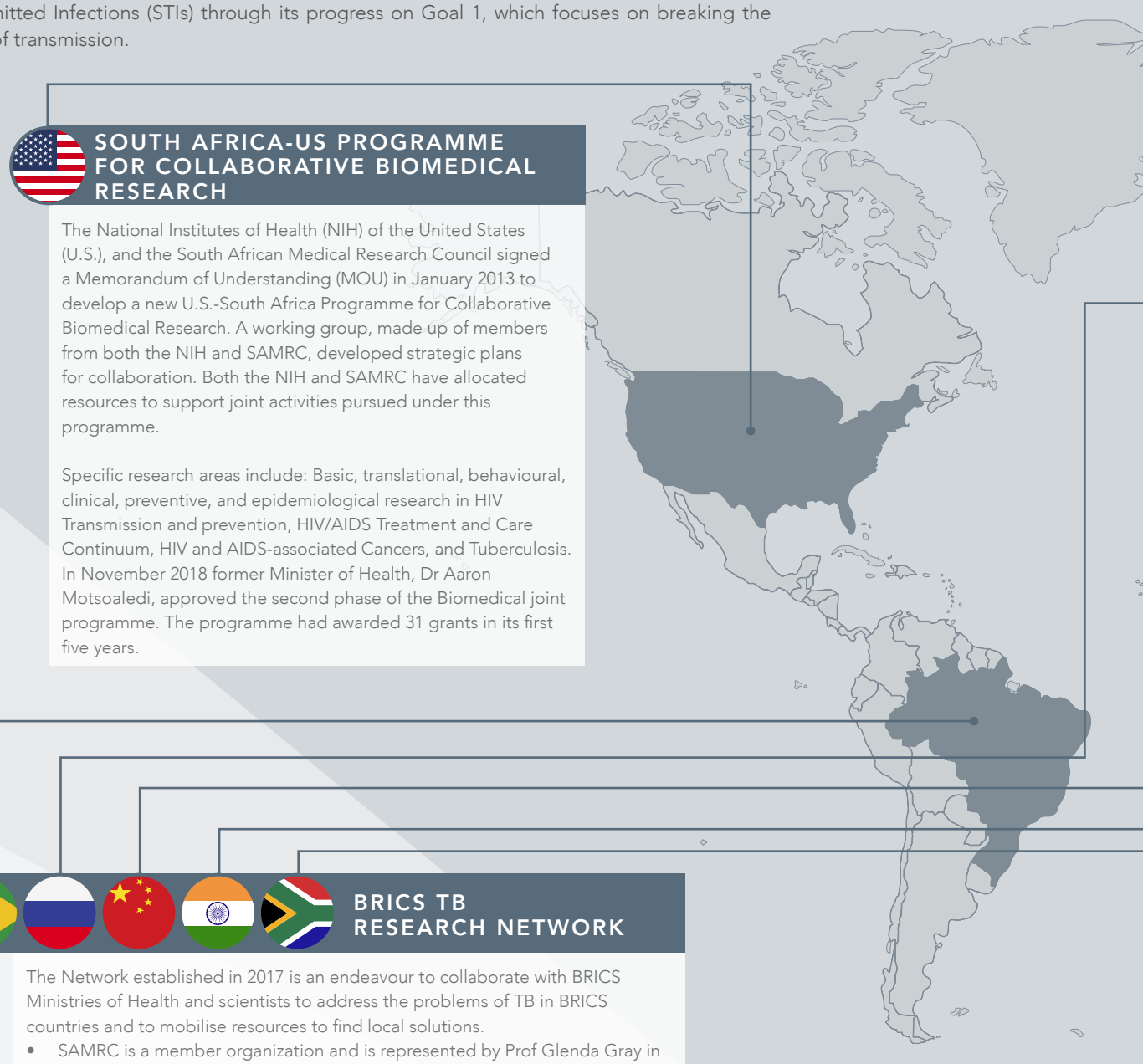
Two other studies undertaken during the reporting period using SAAVI funding included continued enrolment and follow-up of pregnant and lactating women in an open-label randomised control study in KwaZulu-Natal on Immediate or Deferred Pre-exposure Prophylaxis for HIV Prevention, a study that will continue until 2021. The second is the completion of a third population-based survey for HIV in Eastern Cape accident and emergency departments. The surveys, conducted by Walter Sisulu University (WSU) in collaboration with the NIH and Johns Hopkins University, have now been completed in East London, Mthatha and Port Elizabeth. The studies have been instrumental in increasing understanding of HIV prevalence, rate of undiagnosed infection, use of ARVs and linkage to care in the province and have resulted in 4 publications to date and various conference presentations. They have also contributed to building research capacity at the WSU as part of the SAMRC-WSU Research Development Programme, also funded by SAAVI. This programme is supporting 3 Assistant Research Coordinators at WSU in the different Deaneries and various initiatives to increase the university's research intensity, particularly in the health arena, including 8 pilot research projects led by early career researchers and clinicians.

Finally, the SAAVI funds in 2019 supported a new 3-year project at UKZN on the effect of transmitted/founder (T/F) viruses 5' Long Terminal Repeat (LTR) and Transactivation of Transcription (tat) genetic variation on viral reservoir size and latency reversal potential. This project is led by an early career researcher and forms part of the SAMRC's broader HIV cure research portfolio.

PARTNERSHIPS WITH OTHER COUNTRIES

Health Impact

Phylogenetic study characterizing the cycle of HIV transmission between adolescent girls/young women and older young men. The study has influenced policy and was featured in the UNAIDS 2016 report: Get on the Fast-Track: The life-cycle approach to HIV. This particular study has also contributed to the South African National Strategic Plan on HIV, TB and Sexually Transmitted Infections (STIs) through its progress on Goal 1, which focuses on breaking the cycle of transmission.



SOUTH AFRICA-US PROGRAMME FOR COLLABORATIVE BIOMEDICAL RESEARCH

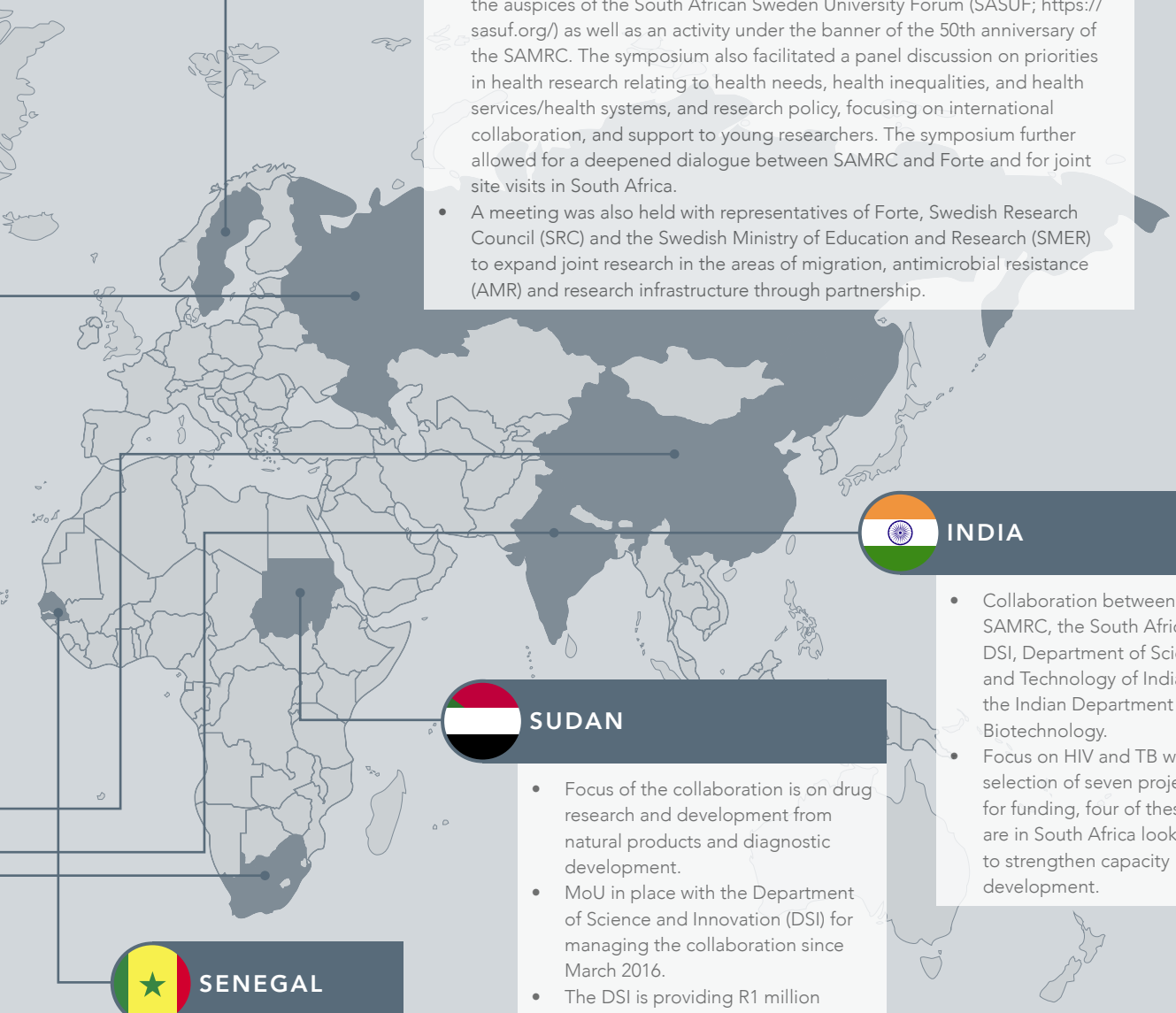
The National Institutes of Health (NIH) of the United States (U.S.), and the South African Medical Research Council signed a Memorandum of Understanding (MOU) in January 2013 to develop a new U.S.-South Africa Programme for Collaborative Biomedical Research. A working group, made up of members from both the NIH and SAMRC, developed strategic plans for collaboration. Both the NIH and SAMRC have allocated resources to support joint activities pursued under this programme.

Specific research areas include: Basic, translational, behavioural, clinical, preventive, and epidemiological research in HIV Transmission and prevention, HIV/AIDS Treatment and Care Continuum, HIV and AIDS-associated Cancers, and Tuberculosis. In November 2018 former Minister of Health, Dr Aaron Motsoaledi, approved the second phase of the Biomedical joint programme. The programme had awarded 31 grants in its first five years.

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.

- SAMRC is a member organization and is represented by Prof Glenda Gray in the SA mission.
- Three Network meetings were held in Beijing (July 2019), New Delhi (Nov 2019) and March 2020 (Geneva).
- The SAMRC hosts the Network's website (bricstb.net) and is hosting the Network's secretariat until further notice.
- A TB Innovation Summit was proposed by the SA mission and arrangements were at an advanced stage to be held in Cape Town in April 2020. Unfortunately, due to the ongoing transmission of the coronavirus and restrictions placed on travel, a decision was made to cancel the meeting.



SWEDEN

SAMRC and the Swedish Research Council for Health, Working Life & Welfare (FORTE) have an MoU effective from August 2015 to strengthen collaboration between South Africa and Sweden in Science, Technology, and Innovation
The current joint research focus areas are inequalities in health, and health systems and healthy systems policies.

- Phase 1, which included a workshop in Oct 2015 and subsequent funding of 11 joint SA-Sweden projects ended in 2019.
- In May 2019 the SAMRC and Forte held a symposium in Cape Town where all 11 collaborative projects were represented. The symposium was held under the auspices of the South African Sweden University Forum (SASUF; https://sasuf.org/) as well as an activity under the banner of the 50th anniversary of the SAMRC. The symposium also facilitated a panel discussion on priorities in health research relating to health needs, health inequalities, and health services/health systems, and research policy, focusing on international collaboration, and support to young researchers. The symposium further allowed for a deepened dialogue between SAMRC and Forte and for joint site visits in South Africa.
- A meeting was also held with representatives of Forte, Swedish Research Council (SRC) and the Swedish Ministry of Education and Research (SMER) to expand joint research in the areas of migration, antimicrobial resistance (AMR) and research infrastructure through partnership.

INDIA

- Collaboration between SAMRC, the South African DSI, Department of Science and Technology of India and the Indian Department of Biotechnology.
- Focus on HIV and TB with a selection of seven projects for funding, four of these are in South Africa looking to strengthen capacity development.

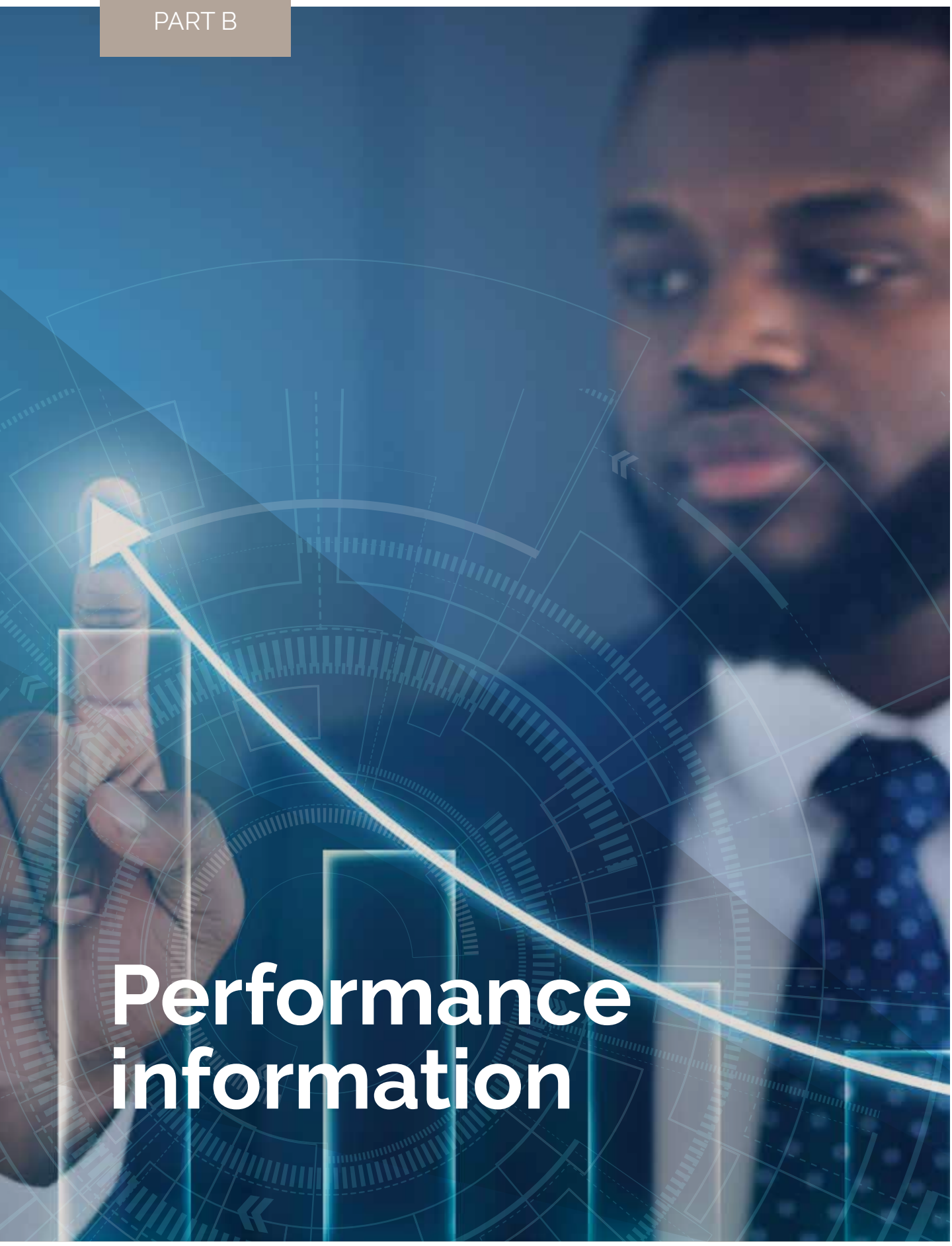
SUDAN

- Focus of the collaboration is on drug research and development from natural products and diagnostic development.
- MoU in place with the Department of Science and Innovation (DSI) for managing the collaboration since March 2016.
- The DSI is providing R1 million over two years for joint projects with matching funding from the Sudanese government for partners in Sudan.

SENEGAL

The collaboration focuses on capacity building, resource mobilisation through joint human capital development programmes, as well as joint strategic research projects.

PART B



Performance information

STATEMENT OF RESPONSIBILITY FOR PERFORMANCE FOR THE YEAR ENDED 31 MARCH 2020

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 2020. The South African Medical Research Council's performance information for the year ended 31 March 2020 has been examined by external auditors and their report is presented on page 206.

The performance information of the South African Medical Research Council set out on pages 22 to 29 have been approved by the Board.

PROFESSOR GLENDA E. GRAY
President & Chief Executive Officer
South African Medical Research Council
31 March 2020

STRATEGIC OUTCOME ORIENTATED GOALS

The South African Medical Research Council is guided by four strategic goals, 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".

ADMINISTER HEALTH RESEARCH EFFECTIVELY AND EFFICIENTLY IN SOUTH AFRICA

GOAL STATEMENT	Strengthening of financial processes towards a clean opinion from the Auditor General
STRATEGIC OBJECTIVES	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
OBJECTIVE STATEMENT	To strengthen financial management, monitoring and evaluation
BASELINE (2018-19)	Improved financial management at all levels within the SAMRC and an unqualified audit
INDICATOR	1.1 Compliance with legislative prescripts, reflected in the final audit report relating to the processes and systems of the SAMRC 1.2 Percentage (%) of the 2019/20 SAMRC total budget spent on salaries and operations of all corporate administrative functions

RECEIVED
7 CLEAN AUDITS
OUT OF THE LAST **8**

The South African Medical Research Council has adhered to strict corporate governance strategies in administering scientific research and received clean audits in seven of the last eight financial years including 2019/20.

STRATEGIC GOAL 2

LEAD THE GENERATION OF NEW KNOWLEDGE AND FACILITATE ITS TRANSLATION INTO POLICIES AND PRACTICES TO IMPROVE HEALTH

GOAL 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
STRATEGIC OBJECTIVES	2.1 To produce and disseminate new scientific findings and knowledge on health 2.2 To promote scientific excellence and the reputation of South African health research 2.3 To provide leadership in the generation of new knowledge in health 2.4 To facilitate the translation of SAMRC research findings into health policies and practices 2.5 To provide funding for the conduct of health research
OBJECTIVE STATEMENT	Number of indexed journal articles published during the year to create and disseminate new quality knowledge through research with expert endorsement from specialists in the field
BASELINE (2018-19)	2.1 936 2.2 251 2.3 787 2.4 538 2.5 6 2.6 176
INDICATOR	2.1 Number of published journal articles, book chapters and books by SAMRC researchers within intramural, extramural research units and collaborating centres at the SAMRC (Malaria, TB, HIV and Cancer), Self-Initiated Research, SHIP and Flagship projects during the reporting period 2.2 Number of journal articles published by SAMRC grant-holders with acknowledgment of SAMRC support during the reporting period 2.3 Number of published indexed impact factor journal articles with a SAMRC affiliated author during the reporting period 2.4 Number of journal articles where the first and/or last author is affiliated to the SAMRC during the reporting period 2.5 Number of policies and guidelines that reference SAMRC research during the reporting period 2.6 Number of research grants (new and renewals) awarded by the SAMRC during the reported period

The South African Medical Research Council is committed to the advancement of science to improve the health of people in South Africa through health research. The National Research Foundation (NRF) aims to build a competitive science system and the NRF rating has become a valuable tool for benchmarking the quality of the SAMRC's researchers against the best in the world.

The number of SAMRC rated scientists has grown from 9 in 2014 to 47 in 2019. This represents a more than five-fold increase over the past five years.

STRATEGIC GOAL 3

SUPPORT INNOVATION AND TECHNOLOGY DEVELOPMENT TO IMPROVE HEALTH

GOAL STATEMENT	Promote the improvement of health and quality of life (prevention of ill health, improvements in public health and treatment) in South Africa through innovation, technology development and transfer
STRATEGIC OBJECTIVES	3. To provide funding for health research innovation and technology development
OBJECTIVE STATEMENT	Number of innovations to promote the improvement of health and quality of life in the country through innovation, technology development and transfer (innovation projects supported, invention disclosures, patents filed and licences concluded) developed in the year
BASELINE (2018-19)	3.1 79 3.2 2
INDICATOR	3.1 Number of innovation and technology projects funded by the SAMRC to develop new diagnostics, devices, vaccines and therapeutics during the reporting period 3.2 Number of new diagnostics, devices, vaccines and therapeutics progressed to the next stage of development during the reporting period

Research & Development Investment

Spending on research and development (R&D) in South Africa continues to increase, although at a slower rate than before. This is the key finding of the 2017/18 National Research and Experimental Development Survey, which was published in October 2019.

South Africa's gross expenditure on research and development (GERD) amounted to R38,725 billion at current rand values in 2017/18, translating to a nominal 8,5 percent increase over the R35,693 billion recorded in 2016/17. At constant 2010 prices, GERD grew by 3,1 percent year-on-year to reach the level of R25,963 billion.

Although this was the seventh consecutive year in which South Africa's GERD has increased, following a contraction in 2009/10 and 2010/11, the growth in real terms shows a declining trend, especially when compared to the peak of 8,3% reported in 2014/15.

Grants, Innovation And Product Development

The SAMRC's Grants, Innovation and Product Development (GIPD) Directorate builds research capacity by optimising grant making opportunities to address South Africa's burden of disease through medical diagnostics, treatments and innovations.

Embedded in GIPD is the Strategic Health Innovation Partnerships (SHIP) a programme funded by the Department of Science and Innovation to enable and optimise health care innovation. SHIP focuses on these core areas:

- Diagnostics and medical devices
- Vaccines
- Platforms
- Drugs for Africa

STRATEGIC GOAL 4

BUILD CAPACITY FOR THE LONG-TERM SUSTAINABILITY OF THE COUNTRY'S HEALTH RESEARCH

GOAL STATEMENT	To provide research support in the broad field of health research, describing original research initiated by a researcher at a recognised research institution and creating and maintaining collaborative research initiatives in collaboration with research programmes. The guiding elements for each initiative/project are: Long-term and sustainable; Focused; Strong corrective action; Private – public partnerships; Africa centric perspective; Innovation; Operationally – best business practices; Technology infrastructure
STRATEGIC OBJECTIVES	To enhance the long-term sustainability of health research in South Africa by providing funding for the next generation of health researchers
OBJECTIVE STATEMENT	Study bursaries, scholarships and fellowships are awarded to students towards a postgraduate degree in health research
BASELINE (2018-19)	4.1 136 4.2 47
INDICATOR	4.1 Number (new and renewals) of SAMRC bursaries, scholarships and fellowships funded for postgraduate study at masters, doctoral and postdoctoral levels during the reporting period 4.2. Number of masters and doctoral students completed or graduated during the reporting period

Year on year, the SAMRC aims to increase the number of masters and doctoral students funded, and to grow the limited critical mass of health researchers, specifically the cohort of interns and clinicians, through the Bongani Mayosi National Health Scholars Programme (BM-NHSP). The BM-NHSP is a public-private partnership with funding from the Public Health Enhancement Fund, an initiative of the National Department of Health. The SAMRC through the Research Capacity Development Division, administers the BM-NHSP.

The collaboration between the National Department of Health, the PHEF and South African Medical Research Council (SAMRC) has been catalytic. PHEF, a non-profit entity created to leverage and contribute to strengthening the health sector, shows private sector's commitment to building the healthcare system.

STRATEGIC OBJECTIVES, PERFORMANCE INDICATORS, PLANNED TARGETS AND ACTUAL ACHIEVEMENTS

STRATEGIC GOAL	STRATEGIC OBJECTIVE	INDICATOR NO.	PROGRAMME PERFORMANCE INDICATOR
Administer health research effectively and efficiently in South Africa	To ensure good governance, effective administration and compliance with government regulations	1.1	Compliance with legislative prescripts, reflected in the final audit report relating to the processes and systems of the SAMRC
	To promote the organisation's administrative efficiency to maximise the funds available for research	1.2	Percentage (%) of the 2019/20 SAMRC total budget spent on salaries and operations of all corporate administrative functions
Lead the generation of new knowledge and facilitate its translation into policies and practices to improve health	To produce and disseminate new scientific findings and knowledge on health	2.1	Number of published journal articles, book chapters and books by SAMRC researchers within intramural, extramural research units and collaborating centres at the SAMRC (Malaria, TB, HIV and Cancer), Self-Initiated Research, SHIP and Flagship projects during the reporting period
		2.2	Number of journal articles published by SAMRC grant-holders with acknowledgement of SAMRC support during the reporting period
	To promote scientific excellence and the reputation of South African health research	2.3	Number of published indexed impact factor journal articles with a SAMRC affiliated author during the reporting period
	To provide leadership in the generation of new knowledge in health	2.4	Number of journal articles where the first and/or last author is affiliated to the SAMRC during the reporting period
	To facilitate the translation of SAMRC research findings into health policies and practices	2.5	Number of policies and guidelines that reference SAMRC research during the reporting period
	To provide funding for the conduct of health research	2.6	Number (new and renewals) of research grants awarded by the SAMRC during the reported period

	SP TARGET (2015/16 – 2019/20)	FINAL 2018/19 PERFORMANCE	REPORTING PERIOD: 2019/20 PERFORMANCE TARGET	FINAL 2019/20 PERFORMANCE	VARIANCE
	Clean audit	Clean audit	Unqualified	Clean audit	
	20%	16%	20%	19%	
	*3150	936	800	1 187	Compliance to the Publications SOP and information sessions have increased applicable publications
	*825	251	214	322	Compliance to the Publications SOP and information sessions have increased applicable publications
	*2 124	787	750	1 038	Compliance to the Publications SOP and information sessions have increased applicable publications
	*1 830	538	550	672	Compliance to the Publications SOP and information sessions have increased applicable publications
	27	6	7	7	
	750	176	186	247	The SAMRC was in a position to award and/or renew more research grants than anticipated. The SAMRC will use the performance for the 2019/20 as a baseline for the 2020/21 reporting period

STRATEGIC GOAL	STRATEGIC OBJECTIVE	INDICATOR NO.	PROGRAMME PERFORMANCE INDICATOR	
Support innovation and technology development to improve health	To provide funding for health research innovation and technology development	3.1	Number of innovation and technology projects funded by the SAMRC to develop new diagnostics, devices, vaccines and therapeutics during the reporting period	
		3.2	Number of new diagnostics, devices, vaccines and therapeutics progressed to the next stage of development during the reporting period	
Build capacity for the long-term sustainability of the country's health research	To enhance the long-term sustainability of health research in South Africa by providing funding for the next generation of health researchers	4.1	Number (new and renewals) of SAMRC bursaries/scholarships/ fellowships provided for postgraduate study at masters, doctoral and postdoctoral levels during the reporting period	
		4.2	Number of masters and doctoral students completed or graduated during the reporting period	

** Signifies that data will be contributed by both intramural and extramural units. Where the symbol does not appear, the data is only from intramural units or SAMRC administrative processes*

SP TARGET (2015/16 – 2019/20)	FINAL 2018/19 PERFORMANCE	REPORTING PERIOD: 2019/20 PERFORMANCE TARGET	FINAL 2019/20 PERFORMANCE	VARIANCE
180	79	40	70	The SAMRC was able to attract more funding towards the development of new diagnostics, devices, vaccines and therapeutics during this financial year. This resulted in the awarding of more grants than anticipated
New Indicator	2	2	2	
435	136	106	157	There were more bursaries, scholarships and fellowships awarded or renewed during the reporting period. New targets set for the 2020 to 2025 SP and 2020/21 APP
New Indicator	47	60	71	Performance for 2019/20 include students that completed during 18/19 FY but did not graduate as per the indicator description. Indicator description was amended for 2019/20 FY to include students that completed or graduated during the reporting period

OUR RESEARCH PROFILE

WE ARE RESPONDING TO THE BURDEN OF DISEASE IN SOUTH AFRICA

South Africa faces a huge burden of four major epidemics that affect the health of the population.

From communicable diseases such as HIV/AIDS and TB; maternal, new-born and child mortality; non-communicable diseases such as hypertension and cardiovascular diseases, diabetes, cancer, and chronic lung diseases; as well as injury and trauma.

MATERNAL, NEWBORN AND CHILD HEALTH

The burden of maternal, newborn and child health on SA is three times above average for comparable countries.

Our research shows that the under **5** mortality rate has decreased to **34** per **1000** livebirths in 2018 from **80** per 1000 livebirths in 2003.

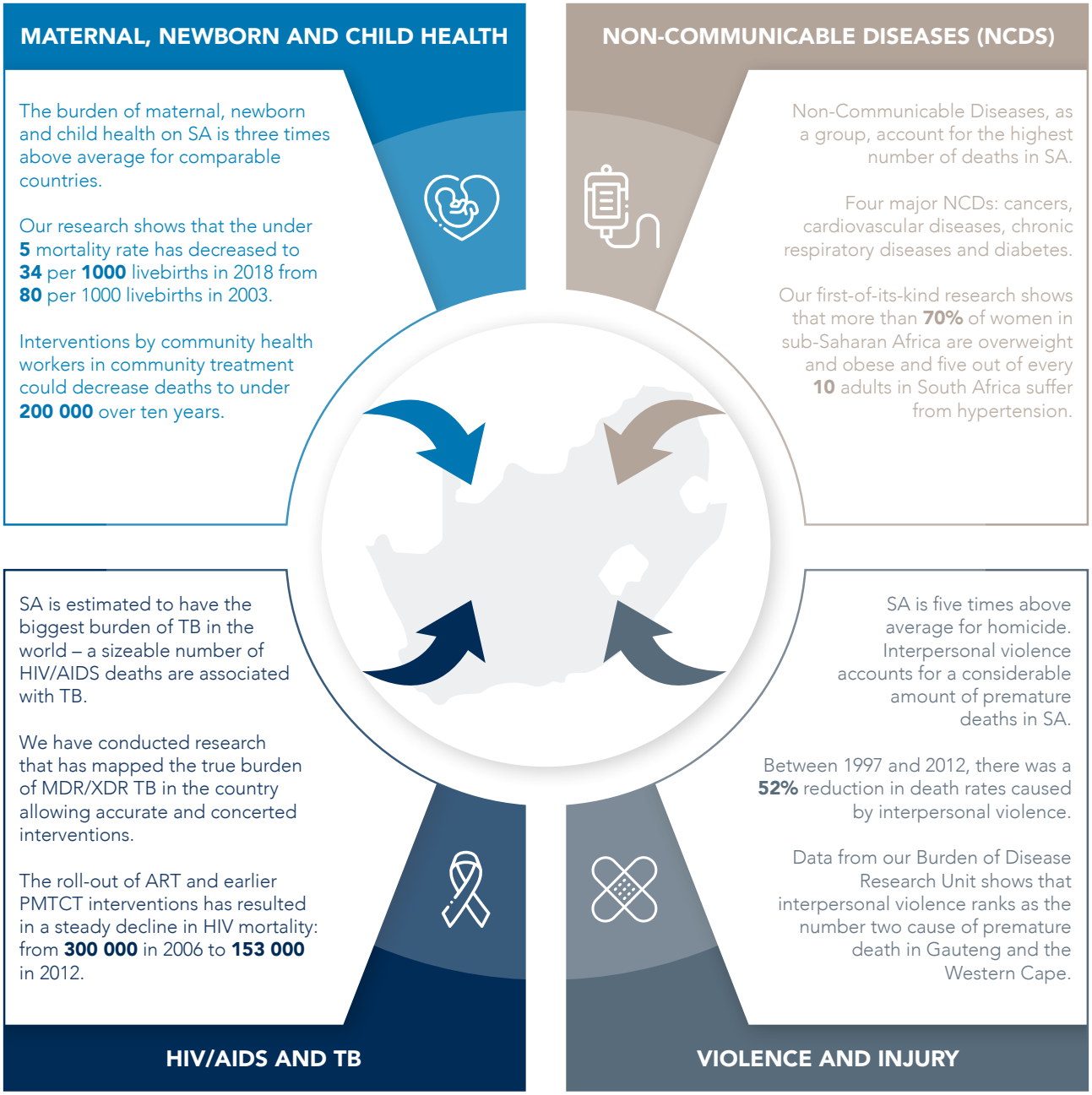
Interventions by community health workers in community treatment could decrease deaths to under **200 000** over ten years.

NON-COMMUNICABLE DISEASES (NCDS)

Non-Communicable Diseases, as a group, account for the highest number of deaths in SA.

Four major NCDs: cancers, cardiovascular diseases, chronic respiratory diseases and diabetes.

Our first-of-its-kind research shows that more than **70%** of women in sub-Saharan Africa are overweight and obese and five out of every **10** adults in South Africa suffer from hypertension.



HIV/AIDS AND TB

SA is estimated to have the biggest burden of TB in the world – a sizeable number of HIV/AIDS deaths are associated with TB.

We have conducted research that has mapped the true burden of MDR/XDR TB in the country allowing accurate and concerted interventions.

The roll-out of ART and earlier PMTCT interventions has resulted in a steady decline in HIV mortality: from **300 000** in 2006 to **153 000** in 2012.

VIOLENCE AND INJURY

SA is five times above average for homicide. Interpersonal violence accounts for a considerable amount of premature deaths in SA.

Between 1997 and 2012, there was a **52%** reduction in death rates caused by interpersonal violence.

Data from our Burden of Disease Research Unit shows that interpersonal violence ranks as the number two cause of premature death in Gauteng and the Western Cape.

The South African Medical Research Council is a health research organisation focusing on the top ten causes, disability and associated risk factors in the South African population. Since 1969 the SAMRC has been at the cutting edge of leading medical research, innovations, development and has strengthened its research translation efforts. The scope of the SAMRC's research includes basic laboratory investigations, clinical research and public health studies.

LEADING CAUSES OF DEATH IN SOUTH AFRICA

- The ***Rapid Mortality Surveillance Report 2017*** derives estimates of key health status indicators primarily from data obtained from the National Population Register.
- Although **life expectancy at birth**, has continued to increase, reaching 64 years in 2017, the pace of improvement has slowed down in recent years.
- Infant and under-five mortality rates have declined to 23 and 32 per 1 000 live births in 2017, respectively. However, the neonatal mortality continues to show no improvement remaining at 12 per 1 000 live births.
- Mortality of children aged 5-15 improved over a period of five years from 11 per 1000 deaths to 6 deaths per 1000 deaths. Children between the ages: 15-24 showed an improvement from 24 deaths to 21 per 1000 children during the same period. These improvements are likely associated with the roll-out of ARTs.
- The maternal mortality ratio peaked in 2009 and has declined to 134 per 100 000 live births in 2016.
- **Life expectancy at age 60 years,** an indicator of mortality experienced at older ages has remained constant at about 17 years, indicating little improvement in health care in recent years.
- Estimates of premature mortality between the ages of 30 and 70 years due to selected non-communicable diseases (NCDs) including cardiovascular diseases, cancer, diabetes and chronic respiratory diseases. The probability of a 30-year old man dying from these non-communicable diseases before the age of 70 years is 34% while the probability of a 30-year old woman dying from these diseases is 24%. The rates have shown no change between 2011 and 2016. Primary health care services need to be more vigilant with diagnosing and managing these diseases and their risk factors. Health promotion efforts to reduce the prevalence of tobacco and alcohol use, increase physical activity and healthy nutrition are essential to reduce the burden of non-communicable diseases.

MORTALITY INDICATORS	2012	2013	2014	2015	2016	2017
LIFE EXPECTANCY AT BIRTH						
Life expectancy at birth **Total**	61.2	62.2	62.9	63.3	63.8	64.2
Life expectancy at birth **Male**	58.5	59.4	60.0	60.3	60.8	61.2
Life expectancy at birth **Female**	64.0	65.1	65.8	66.4	66.9	67.6
YOUNG CHILD MORTALITY (0-5 YEARS)						
Under-5 mortality rate (U5MR) per 1 000 live births	11.0	8.1	7.4	7.0	6.6	6.0
Infant mortality rate (IMR) per 1 000 live births	11.9	8.9	8.4	7.9	7.5	7.0
Neonatal mortality rate (<28 days) per 1 000 live births	10.1	7.3	6.5	6.2	5.6	5.1
OLDER CHILDREN & YOUNG ADOLESCENTS (5-14 YEARS)						
Older children & young adolescents ($_{10}q_5$ per 1000) **Total**	11.0	8.1	7.4	7.0	6.6	6.0
Older children & young adolescents ($_{10}q_5$ per 1000) **Male**	11.9	8.9	8.4	7.9	7.5	7.0
Older children & young adolescents ($_{10}q_5$ per 1000) **Female**	10.1	7.3	6.5	6.2	5.6	5.1
OLDER ADOLESCENTS & YOUTH (15-24 YEARS)						
Older adolescents & youth ($_{10}q_{15}$ per 1000) **Total**	24.5	23.5	22.5	22.1	21.4	21.4
Older adolescents & youth ($_{10}q_{15}$ per 1000) **Male**	25.9	25.9	25.6	25.7	25.3	25.9
Older adolescents & youth ($_{10}q_{15}$ per 1000) **Female**	23.2	21.1	19.5	18.4	17.5	17.0

OUR RESEARCH PROFILE (CONTINUED)

MORTALITY INDICATORS	2012	2013	2014	2015	2016	2017
ADULT MORTALITY (15-59 YEARS)						
Adult mortality ($_{45}q_{15}$) **Total**	38%	36%	34%	34%	33%	32%
Adult mortality ($_{45}q_{15}$) **Male**	44%	42%	40%	40%	39%	38%
Adult mortality ($_{45}q_{15}$) **Female**	32%	30%	28%	28%	27%	26%
LIFE EXPECTANCY AT AGE 60						
Life expectancy at age 60 **Total**	17.6	17.4	17.4	17.3	17.4	17.4
Life expectancy at age 60 **Male**	15.5	15.3	15.3	15.2	15.2	15.2
Life expectancy at age 60 **Female**	19.2	19.1	19.1	19.0	19.1	19.1
CAUSE SPECIFIC INDICATORS	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
MATERNAL MORTALITY (15-49 YEARS)						
Maternal mortality ratio (MMR) per 100 000 live births	200	165	154	164	152	134
PREMATURE MORTALITY ATTRIBUTED TO CARDIOVASCULAR DISEASE, CANCER, DIABETES OR CHRONIC RESPIRATORY DISEASE (PEOPLE AGED 30-69 YEARS)						
Cardiovascular disease $_{40}q_{30}$ **Total**	15%	15%	14%	15%	14%	14%
Cardiovascular disease $_{40}q_{30}$ **Male**	18%	18%	17%	18%	18%	17%
Cardiovascular disease $_{40}q_{30}$ **Female**	12%	12%	11%	11%	11%	11%
Cancer $_{40}q_{30}$ **Total**	9%	9%	9%	9%	9%	9%
Cancer $_{40}q_{30}$ **Male**	10%	10%	11%	11%	11%	10%
Cancer $_{40}q_{30}$ **Female**	7%	7%	7%	8%	8%	8%
Diabetes $_{40}q_{30}$ **Total**	5%	5%	5%	5%	6%	5%
Diabetes $_{40}q_{30}$ **Male**	5%	5%	5%	6%	6%	5%
Diabetes $_{40}q_{30}$ **Female**	5%	5%	5%	5%	5%	5%
Chronic respiratory disease $_{40}q_{30}$ **Total**	4%	4%	4%	4%	4%	4%
Chronic respiratory disease $_{40}q_{30}$ **Male**	6%	6%	6%	6%	6%	6%
Chronic respiratory disease $_{40}q_{30}$ **Female**	3%	3%	2%	2%	2%	2%

Source: Rapid Mortality Surveillance Report 2017 published by South African Medical Research Council.

RANK	CAUSE	NO. OF DEATHS	% DEATHS
1	**HIV/AIDS**	153 661	29.1
2	**Cerebrovascular disease**	39 830	7.5
3	**Lower respiratory infections**	25 977	4.9
4	**Ischaemic heart disease**	24 969	4.7
5	**Tuberculosis**	23 817	4.5
6	**Diabetes mellitus**	18 894	3.6
7	**Hypertensive heart disease**	18 755	3.5
8	**Interpersonal violence**	18 741	3.5
9	**Road injuries**	17 597	3.3
10	**Diarrhoeal diseases**	16 349	3.1
	Top 10 causes	**358 590**	**67.8**
	Total	**528 947**	**100.0**

Source: Pillay-van Wyk et al, Lancet Global Health 2017.

To conduct health research, the SAMRC research units are based at offices in Cape Town, Gauteng and Durban. These units are called intramural research units (IRUs). Extramural Research Units (ERU) based at various universities across the country, enable scientists based at tertiary institutions to conduct research funded by the SAMRC.

We focus on responsive health research and innovation to respond to the National Department of Health's promise of a long and healthy life for all South Africans. We research, analyse and categorise the causes of death, to find suitable ways to prevent disease in a certain population group, or to improve the standard of living of those living with existing medical conditions. This work is conducted by our research units, these are either Intramural Research Units (IRU) or Extramural Research Units (ERU).

The SAMRC is aligned to support the National Department of Health and South Africa's changing health research needs. As a leading health research organisation, the SAMRC responds to the Sustainable Development Goals (SDGs), the National Development Plan (NDP): Vision 2030. The SAMRC aims to conduct research and implement initiatives into the following SDGs:

(a) SDG 2, by conducting research into the nutritional needs of pregnant women, infants and children;

(b) SDG 3 by conducting research:

that reduces:

- maternal deaths and preventable deaths of new-borns and children under 5,
- HIV, TB and other communicable diseases,
- non-communicable diseases like hypertension, cardiovascular disease and stroke,
- alcohol and other drug abuse,
- violence and injury, and
- sexual and reproductive health issues, in the area of:
- universal health coverage,
- environmental health,
- vaccine and affordable medicine for non-communicable and communicable diseases,
- capacity development, and
- climate change

(c) SDG4 and 10 by addressing the SAMRCs fourth goal of developing capacity in health research;

(d) SDG 5 by focusing on research into gender-based violence and developing interventions to address violence against women and children;

(e) SDG 6 through collaboration with our extramural unit at the University of Fort Hare on water quality;

(f) SDG 7,11 and 13 through ongoing research done by our intramural unit that looks at environmental research;

(g) SDG 8 and 9 by focusing on Goal 3 which is to conduct research into innovation and product development; and

(h) SDG 17 through research done by our Violence, Injury and Peace Research Unit by collaborating with global research partners.

The SAMRC Programmes and Units are:

RESEARCH PROGRAMME 1

HEALTH PROMOTION AND DISEASE PREVENTION

NSDA 1: INCREASING LIFE EXPECTANCY

UNITS THAT CONSTITUTE THIS PROGRAMME

1. Alcohol, Tobacco and Other Drugs Research Unit (IRU)
2. Anxiety and Stress Disorders Research Unit (ERU)
3. Non-Communicable Diseases Research Unit (IRU)
4. Environment and Health Research Unit (IRU)
5. Rural Public Health and Health Transition Research Unit (ERU)
6. Violence, Injury and Peace Research Unit (IRU)
7. Hypertension and Cardiovascular Disease Research Unit (ERU)
8. Microbial Water Quality Monitoring Research Unit (ERU)
9. Centre for Health Economics and Priority Setting Research Unit (ERU)
10. Centre for Health Economics and Decision Science-PRICELESS (ERU)

RESEARCH PROGRAMME 2

MATERNAL, CHILD AND WOMENS' HEALTH

NSDA 2: DECREASING MATERNAL AND CHILD MORTALITY

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 Research Unit (ERU)

RESEARCH PROGRAMME 3

HIV, AIDS, TB AND OTHER COMMUNICABLE DISEASES

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

UNITS THAT CONSTITUTE THIS PROGRAMME

1. HIV Prevention Research Unit (IRU)
2. Centre for Tuberculosis Research Unit (IRU)
3. Molecular Mycobacteriology Research Unit (ERU)
4. Respiratory and Meningeal Pathogens Research Unit (ERU)

RESEARCH PROGRAMME 4

HEALTH SYSTEMS STRENGTHENING

NSDA 4: STRENGTHENING HEALTH SYSTEMS EFFECTIVENESS

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. HIV-TB Pathogenesis and Treatment Research Unit (ERU)
6. Health Services to Systems Research Unit (ERU)

RESEARCH PROGRAMME 5

PUBLIC HEALTH INNOVATION

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)

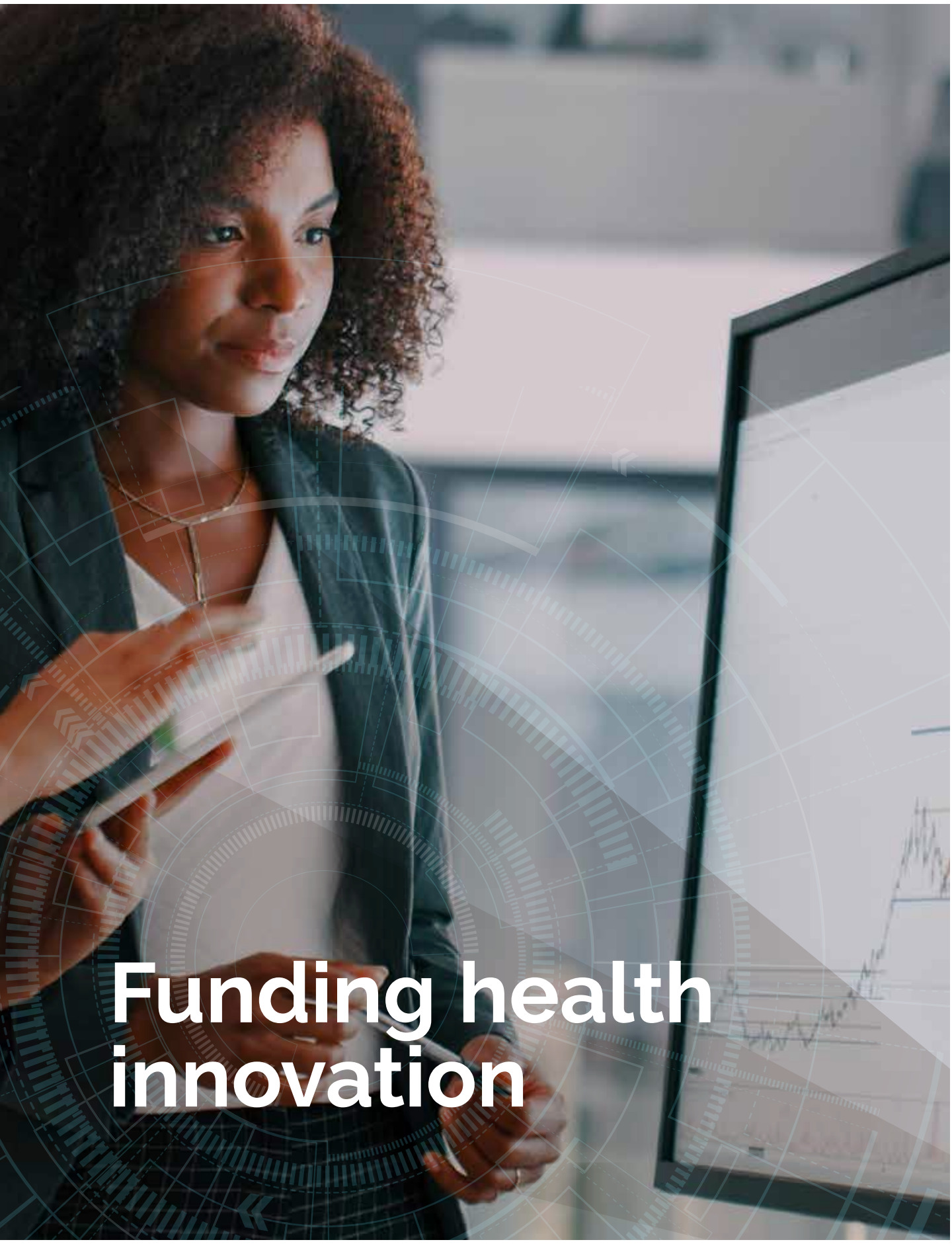
RESEARCH PROGRAMME 6

BIOMEDICAL RESEARCH

NSDA 4: STRENGTHENING HEALTH SYSTEMS EFFECTIVENESS

UNITS THAT CONSTITUTE THIS PROGRAMME

1. Bioinformatics Capacity Development Research Unit (ERU)
2. Immunology of Infectious Diseases Research Unit (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 Prevention and Novel Drug Targets for HIV-Associated Cancers Research Unit (ERU)
7. Wound and Keloid Scarring Translational Research Unit (ERU)
8. Antibody Immunity Research Unit (ERU)
9. Cardiometabolic Health Research Unit (ERU)



Funding health innovation

GRANTS, INNOVATION AND PRODUCT DEVELOPMENT

OVERVIEW

The Grants, Innovation and Product Development (GIPD) directorate of the SAMRC is the custodian of grant funding (including innovation), IP management and commercialisation. We therefore report on strategic goals 2 and 3 in the Annual Performance Plan (APP) relating to programme 2 (Core Research) and Programme 3 (Innovation and Technology). There are a number of programmes that fall under GIPD, many of which involve strategic partnerships with organizations that include the Department of Science and Innovation (DSI), the Newton Fund, the Bill and Melinda Gates Foundation (BMGF), The African Academy of Sciences (AAS) and PATH.

In addition to the above partnerships, GIPD represents South Africa on several national and international bodies and include:

- The Joint Programme In Anti-Microbial Research (JPIAMR, www.jpiamr.com),
- Grand Challenges South Africa (https://grandchallenges.org/video/grand-challenges) and
- Healthy Life Trajectories Initiative (HeLTI).
- The National Health Research Committee
- The Ministerial Advisory Committee for Anti-Microbial Resistance
- The Inter-ministerial committee for Medical Cannabis
- The TB Think Tank

FUNDING IMPACT & STRATEGIC ALIGNMENT

The Directorate is responsible for a significant proportion of the SAMRC's external funding mechanisms, including product development funds. Since it was first established in 2013, the level of funding has grown from R33M per year to more than R150M per year. This has been achieved through the establishment of a number of global strategic partnerships with external partners supported by a strong and diverse grant management team and robust processes.

Everything that is funded seeks to address a national priority. This is achieved through a variety of mechanisms such as:

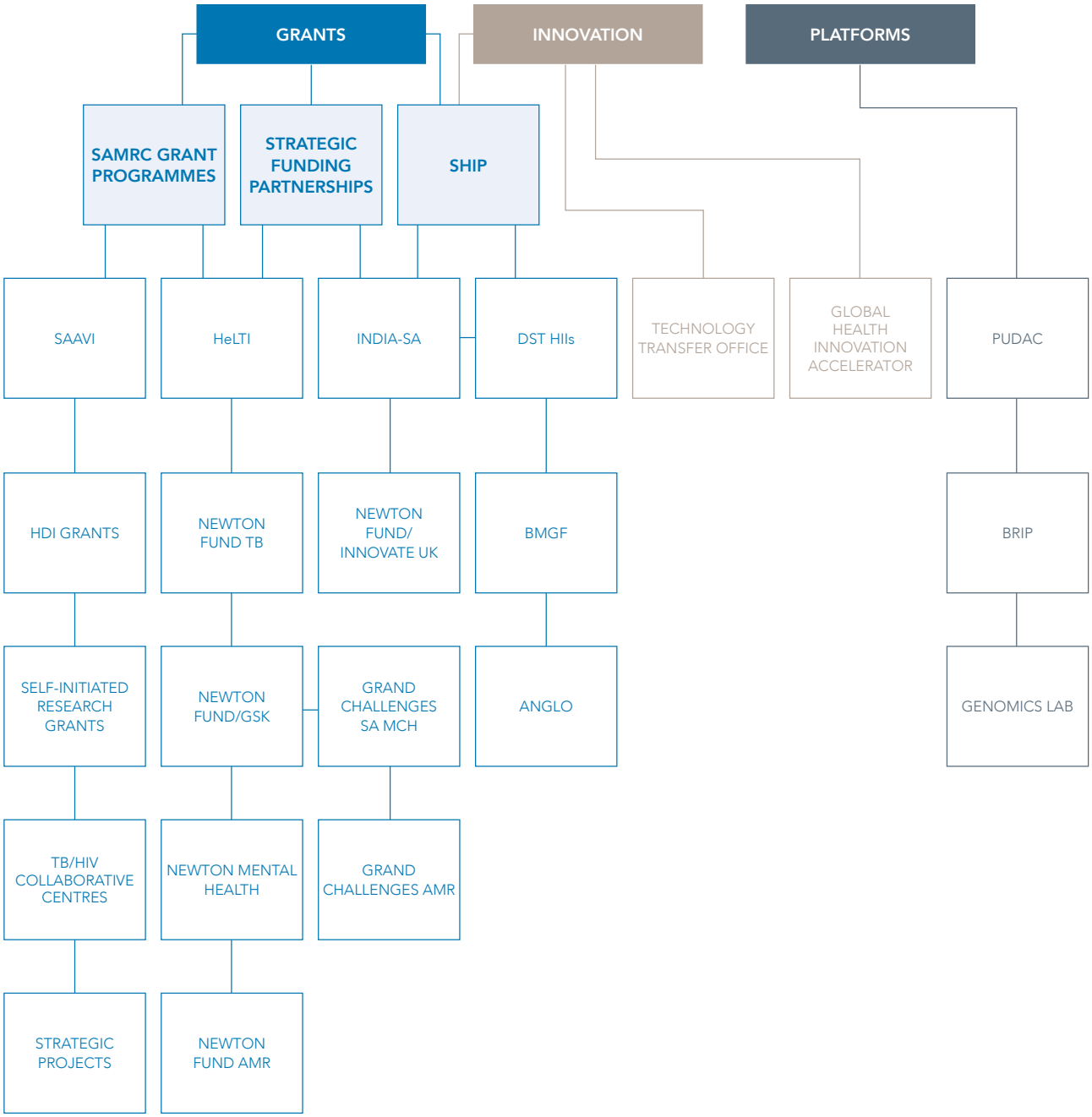
- Targeting area to address key gaps in knowledge. For example, Mental health
- Targeting calls to address key gaps in healthcare. For example, the recent precision medicine call seeking to understand treatment failure of NCD regimens in Africa

GIPD operates at a truly global level and almost everything the GIPD does is in partnership with many international partners. In the reporting year the Directorate has initiated partnerships directly or indirectly with the WHO, JPIAMR, China, India, Brazil, the AAS, UK, NIH and the Gates Foundation.

GIPD PROGRAMMES

The Division manages a vast array of different grant and innovation programmes as well as several research platforms as illustrated in the figure below.

Figure: GIPD programmes



Grand Challenges meeting in New Delhi March 2019.

THE DEPARTMENT OF SCIENCE AND INNOVATION

Grants, Innovation and Product Development manages three major programmes for the DSI:

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. It incorporates all DSI-funded projects and initiatives managed by the SAMRC as well as DSI - and SAMRC-leveraged strategic partnerships for health innovation.

SHIP has established robust governance, project selection and project management structures and processes that have stood up to rigorous external auditing, substantially expanded its funding sources for health innovation through strategic partnerships and programmes, and established a diverse portfolio of >40 projects ranging from discovery to implementation, with the predominant focus being on product development and testing.

The Newton Fund

Under the Newton Fund programme, the SAMRC has worked with several UK funding partners – UKMRC, ESRC, GSK and Innovate UK (now called UKRI) to fund a portfolio of more than 30 cutting edge research projects and programmes in a range of important areas. These include:

- Non-communicable diseases of Africa,
- TB implementation science,
- Precision medicine product development
- Mental health
- Anti-microbial resistance.

Several of these projects involve collaborators in other African countries in addition to the UK. A notable feature of this partnership has been the research focus as all projects selected for funding seek to understand and address the disease burden of (South) Africa. The research exchange has been truly bilateral as both South African and UK scientists have benefited from the partnership. This has been a very successful global leading partnership and one that the SAMRC is keen to expand upon. Recent activities include:

- Newton NCD Mid-Term Review meeting: 17 April 2020. The SAMRC together with MRCUK and GSK hosted a mid-term review of the Non-Communicable diseases programme. The programme showcased project outcomes in the field of Cancer, Diabetes, CVD and CKD. The meeting was attended by prominent experts in the field of NCD including SAMRC President, Prof Glenda Gray and the Deputy Director-General for Health in South Africa, Dr. Yogan Pillay.

BEIS visit, Jan 2020: Demonstration of the technology including the BEIS colleagues

Indo-SA PGMC meeting: New Delhi India
March 2019 SAMRC and DBT and DST India

The Gates Foundation:

GIPD has engaged with the Gates Foundation on several programmes and projects. Apart from the Grand Challenges South Africa programme, the Directorate continues to manage several very successful grants through SHIP using funds from the Foundation to support cutting edge research and development in the HIV and TB research arenas. These conclude in 2020, however, these have resulted in several high impact publications as well as scientific advancements that are changing some of the fundamental assumptions on TB and HIV disease and immunology.

The Learning and Evaluations meeting for the Global Grant Challenges team – March 2019 Delhi

The Foundation is an important co-funder on SHIP's drug discovery programmes and has renewed its commitment to these in the current reporting period.

A grant from the Foundation to the GHIA programme of GIPD has seen an acceleration of this joint initiative with PATH in the last two years, with three new innovation staff members being employed and trained, a doubling of the programme's project portfolio, substantial progress on three of the GHIA projects towards commercialization and tripling of the Foundation investment to date through funds raised for GHIA projects and activities.

SUCCESS STORIES

THE SAMRC GENOMICS CENTRE

The establishment of the SAMRC Genomics Centre has closed a niche infrastructure gap for South Africa. The centre was officially opened in July 2019 and boasts the capacity and infrastructure to perform cost effective Whole Human Genome sequencing, with the latest in Next Generation Sequencing technology from the BGI-Shenzhen. The centre is a national platform and has already commenced in scaling up its activity to establish its sequencing workflow. We have incorporated an accelerator server to also processes the large volumes of sequencing data and storage capacity at the SAMRC. A state-of-the-art laboratory management system has also been implemented to gear the centre toward larger volumes of sample processing.

The collaborative project with SAMRC's sister lab KwaZulu-Natal Research and Innovation Sequencing Platform (KRISP), has provided the necessary scenarios to gear the workflow toward scalability and a training ground for the centre's recently recruited core scientists. Soon the centre will have the necessary skills and capability to execute an efficient workflow and drive the accreditation process toward creating the best practice standards for whole genome sequencing. This will help the SAMRC in its vision to build capacity for the 4th industrial revolution as the scalability of genome sequencing increases, we will increase training and development of data driven science within the SAMRC and in partnership with the omics network within the country.

UMBIFLOW

The Umbiflow technology, developed and owned by the SAMRC and CSIR, has now been demonstrated in two extensive studies in South Africa, one in Mamelodi and the other in 9 different districts throughout South Africa, to significantly reduce the prevalence of unexplained stillbirths when used to screen low risk pregnancies. The Mamelodi study identified absent end-diastolic flow in 1.5% of the population screened and demonstrated that the perinatal mortality rate for 12 168 women who did not have an Umbiflow screen was 21.3/1 000 births, significantly higher than that in the Umbiflow group (11.4/1 000 births) (risk ratio 0.58, 95% confidence interval 0.42 – 0.81) (Nkosi et al., 2019).

The 9-district study data is still being analysed but is showing a similar trend. Considering these results, the National Department of Health in July 2019 made the decision to roll out the use of Doppler screening of pregnant women in South Africa. The SAMRC, CSIR and University of Pretoria are engaging with the NDoH to support the implementation of the technology. In parallel, the CSIR is improving on the technology and upgrading the software to allow use on other types of devices.

SUCCESS STORIES

ELLAVI UTERINE BALLOON TAMPONADE

The SAMRC has continued to support clinical studies on the Ellavi uterine balloon tamponade (UBT), the first low-cost regulated UBT made in Africa to help protect women from post-partum haemorrhage, the leading cause of maternal death. The device has now been tested in the hands of mid-wives in the Western Cape and in a rural clinic in the Eastern Cape. These studies have confirmed the ability of the UBT to rapidly halt bleeding and save lives, demonstrating high acceptability, safety, and efficiency.

The UBT was developed by Sinapi Biomedical with support from PATH. Sinapi has now received regulatory approval by the Ghana Food and Drugs Authority and the Kenya Pharmacy and Poisons Board for use of this medical device in each country as well as receiving a CE mark. The Ellavi has been adopted by 31 South African hospitals (five provinces) during 2019. In addition to South Africa, the Ellavi has been sold in Botswana, Lesotho, Swaziland, Kuwait, Puerto Rico, Brazil with registrations underway in a few more countries.

PRCR DIAGNOSTIC

According to the World Health Organization, preventing and treating preeclampsia and eclampsia is a necessary step towards achieving the health targets of the Sustainable Development Goals (SDGs). It is estimated that preeclampsia is responsible for 70-80 000 maternal and 500 000 perinatal deaths, annually, and over 90% of these deaths occur in low- and middle-income countries (LMICs), such as South Africa. The WHO therefore, in its guidelines published in 2011, posed that efforts targeted at preventing and reducing mortality and morbidity caused by these conditions could help address the profound inequities on maternal and perinatal health globally. The main factor that places women in LMICs at higher risk of death from these conditions is the lack of tools to timeously identify individuals at high risk, such that they can be linked to appropriate care.

To address this, the SAMRC, through the Grand Challenges South Africa programme, supported a project aimed at developing an affordable, highly accurate, easy-to-use strip test to evaluate and monitor proteinurea, a key indicator used to identify pregnant women at risk for preeclampsia. The strip test, Test-it PrCr, has been successfully developed and demonstrated to be as effective as the 24-hour urine test, which is the current standard method for accurate measurement of proteinuria. Test-it PrCr, in addition to being accurate, offers added benefits in terms of cost and simplicity. For example, the 24-hour urine test is technically complex and expensive, owing to the need for hospital admission. On the other hand, Test-it PrCr can be provided at R1,00 per test and results obtained within 60 seconds, whereas the 24- hour urine test costs R50 and above through the NHLS and private laboratories. Following successful usability testing in Ghana, Test-it PrCr is registered and sold in several countries including Ghana, Egypt, Philippines, Venezuela, Angola, Zimbabwe and the DRC. The test is also registered in South Africa and obtained CE marking, making it eligible for sales in Europe.

SUCCESS STORIES

EASTERN CAPE RESEARCH SYMPOSIUM

GIPD hosted the inaugural Eastern Cape Research Symposium "Advancing Research in the Eastern Cape Province" in East London in August 2019. The objectives of the meeting were to showcase health research in the Eastern Cape; present health priorities and identify research gaps in the Eastern Cape; foster research collaboration, partnerships and networks with the Eastern Cape universities; and to identify thematic areas for funding. There were 102 delegates who attended from the University of Fort Hare, Walter Sisulu University, Rhodes University and Nelson Mandela University. Key stakeholders who attended represented the Eastern Cape Department of Health, Department of Science and Innovation, Metropolitan, the Newton Fund, Foundation of Professional Development, Foundation for Innovative New Diagnostics, and Jembi Health Systems.

PRECISION ONCOLOGY COMES TO SOUTH AFRICA

The South African UK collaborative development of precision medicine solutions with SHIP and Newton fund has given rise to the development of a non-communicable disease and breast cancer (BRCA) genomic test kit with UK based company called LGC Pty Ltd. This project also entails a technology transfer of the operational LGC point of care PARADNA technology, and manufacturing of the non-communicable disease and breast cancer (BRCA) genomic test kit to the Stellenbosch University and Gknowmix Pty Ltd teams. This will be the first SHIP supported omics technology being transferred for product manufacture and potential implementation study in South Africa. The illustration below shows the sequence of events to be executed within the Gknowmix workflow in using this test to commence with first line screening.

GSK/NOVARTIS AWARD

The Africa GRADIENT (Genomic Research Approach for Diversity and Optimising Therapeutics) project was initiated in 2018 as a collaboration between GSK and Novartis, who partnered with GIPD to administer awards in tuberculosis (TB) and malaria. The aim is to establish a consortium to collaborate with expert academic centres and regulatory authorities in Africa, and to support high quality research on African genetic diversity of relevance to drug therapeutics. The focus is to evaluate genetic diversity as the contributing factor to variability in exposure and/or safety, and response to drugs used to treat TB and malaria in Africa.

The first awards will be fellowships for individual researchers. These awards will focus on mining the available data in public databases, biorepositories, published articles, case reports and other relevant literature and resources. The second awards will be allocated for investigator-sponsored research. The focus will be on hypothesis driven research projects generating new data to understand regional variation in African genetic diversity and the potential consequences on drug responses to TB and/or malaria treatment. The awards will be launched in 2020.

SUCCESS STORIES

DIGITAL HEALTH

NCEDISO™

MEDICAL INFORMATION AND FIRST AID HELP AT THE PRESS OF A BUTTON

The SAMRC funded a grant at Nelson Mandela University a number of years back to develop an App for health screening at schools. This evolved to include general healthcare information and received additional funding from the Technology Innovation Agency. Fast forward a few years NcedisoTM – Medical information and First Aid Help at the press of a button.

The mobile App, NcedisoTM originated from the need for community healthcare workers including nurses and clinic practitioners to be upskilled in locations where access to basic healthcare, First Aid skills and clinics are scarce. The application allows for the early detection of various disabilities and diseases among children, child nutrition, chronic disease management, information on infectious and non-infectious diseases, First Aid and various other conditions.

The App is also used to assist the ordinary person who has limited access to healthcare facilities to make an easy assessment of specific symptoms. Health workers have information to more accurately diagnose chronic health conditions such as diabetes, tuberculosis and acute malnutrition in children. The App is unique as it contains ailments and medications relevant to the African continent only. Given the connectivity constraints, it can be used in offline mode, requiring no data whilst not storing any personal information.

The home-grown healthcare app Ncediso™ ended in the top three awards and won the top innovation award in the category of high social impact at the United Nations Economic Commission for Africa hosted by Zimbabwe in February 2020.

ROAD TO HEALTH

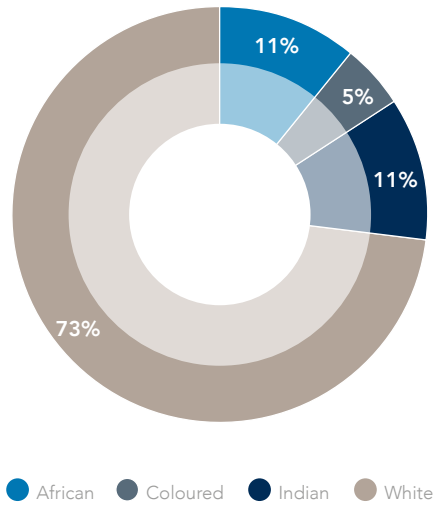
The application of digital technologies in the delivery of health services is a global trend that the SAMRC is supporting locally. The SAMRC has partnered with Jembi Health System NPC, a spin-out of the SAMRC, to establish the SAMRC-Jembi Collaborating Centre for Digital Health Innovation. This Centre is a key avenue through which the SAMRC is supporting capacity development, research, national strategy development and technology development and implementation in the digital health arena. The Collaborating Centre has been instrumental in driving communication and coordination with all relevant stakeholders, including the NDoH, in this arena and has established a number of new collaborations with SAMRC units, the CSIR and various universities. It is also actively engaging with the NDoH to identify how the digital health aspects of NHI implementation can be supported.

A flagship project of the Centre, funded through SHIP, together with Johnson & Johnson, Elma Foundation and Metropolitan Health, is the development and implementation of HealthConnect, an enabling platform that will allow the NDoH to manage mhealth applications within a standards-based framework. The platform provides all the required technology to ensure only NDoH curated mhealth applications are available to registered health care workers. This ensures data interoperability, reduction in mobile data costs as well as a lower barrier to entry for innovative applications. The development of the base platform has been completed and was successfully demonstrated to the NDoH in October 2019. Discussions on the further improvement and implementation of the platform are underway with the NDoH.

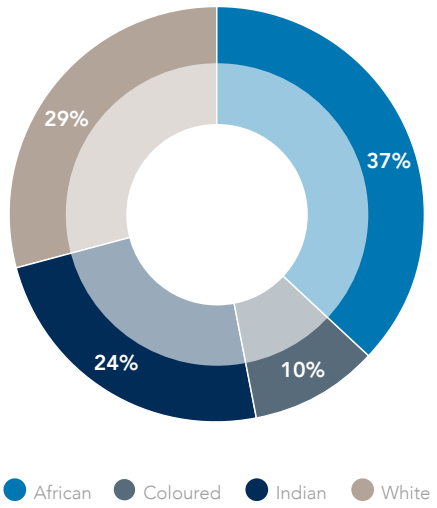
SELF-INITIATED RESEARCH GRANTS (SIR): TRANSFORMING OUR RESEARCH FUNDING STREAMS

There was an imbalance in the allocation of Self-Initiated Research Grants until the 2013/14 financial year. To make the allocation of SIR grants more representative new guidelines were applied that included separating the researchers according to experience and considering the historic under-resourcing of selected universities. This resulted in a shift over the years, see the graphs below for the allocation of SIR grants during the 2013/14 in contrast to the 2019/20 financial period.

2013/14



2019/20



Contact Details:
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Research capacity development

BUILDING HUMAN CAPACITY IN HEALTH

OVERVIEW

Building capacity for the long-term sustainability of health research is considered a priority for the SAMRC to attain health research transformation, and fully achieve other strategic goals of administering health research effectively and efficiently, leading the generation of new knowledge, supporting innovation and technology development. Accordingly, the SAMRC's Division of Research Capacity Development (RCD) promotes the growth of health research capacity by offering scholarships to South African citizens studying towards their Masters, PhDs in Medical, Health and Clinical Sciences and research grants and fellowships for Postdoctoral work and health research by mid-career scientists and seasoned researchers at South African universities.

GROWING THE NEXT GENERATION OF SCIENTISTS

Focus areas: research and innovation in the fields of HIV/AIDS and TB, non-communicable diseases, maternal, child and women's health as well as violence and injury.

The outcomes of the research transformation and capacity building for RCD programmes are consistent. In terms of race and gender and the HDI capacity building, RCD programmes perform well given the previous national minimum intake targets of 55% female and 88% generic Black participants.

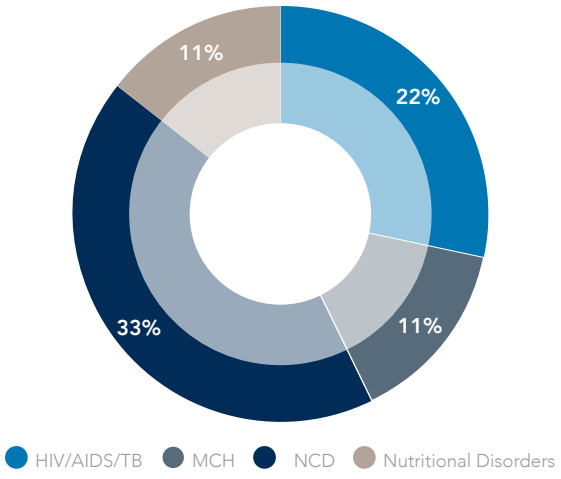
Interestingly, while the 2018/2019 overall SAMRC awards per gender was 56% female with 41% African black, and 34 % White, the RCD programmes have achieved 73% female with overall 60% African black, 12% Coloured and 10% Indian, supporting the significant contribution by RCD programmes into the overall SAMRC transformation performance.

The focus areas which are aligned with the SAMRC's research profile and objective to address South Africa's quadruple burden of disease, supports a rigorous and highly monitored awarding process from the request for applications (RFA) to the selection of the awardees (participants). Hence, each RFA clarifies the target candidates and the respective areas of research according to the national research priorities and top causes of death and disability.

HEALTH IMPACT

The Biostatistics Human Capacity Building programme is geared towards projects that have big potential for policy or practice, or that will influence further research. This is because the work in this programme produces information for evidence based future objectives in research fields. The programme started in 2019 with nine awardees (55% African Black and 78% females). Although the research area covered by the programme falls under the broad research area of Public Health/Health System Strengthening (HSS), 78% of the participants conduct their research in disease-related areas including non-communicable diseases (33%), HIV/AIDS/TB (22%), Maternal, Child and Women's Health (MCH) and nutritional disorders (22%).

Award per priority research area



MCH: Maternal Child and Women Health; NCD; Non-Communicable Diseases, CVD: cardiovascular diseases, IHD: ischemic heart disease, Cerebro-VD: cerebrovascular diseases, HHD: hypertensive heart diseases

THE FOURTH INDUSTRIAL REVOLUTION

The Fourth Industrial Revolution (4IR) has been defined as technological developments that blur the lines between physical, digital and biological spheres, it integrates systems, Internet of Things (IoT), big data, Artificial Intelligence (AI) and robotics, among others. RCD is addressing the question of growing human capacity in the area of the 4IR. The Division has launched an RFA to address exactly that: the digital age.

"The purpose of this particular request for applications (RFA) is to build capacity in four priority research areas namely: (i) mental health, (ii) violence, injury and trauma, (iii) digital health and (iv) rural health. The current funding opportunity is targeting applicants who preferably hold an MBChB or Masters degree in public health or biostatistics and registration at a historically disadvantaged institution will be considered a distinct advantage" (Bongani Mayosi National Health Scholars Programme RFA, December 2019).

Scientists and programmes in 2019/20

	BENEFICIARY	AMOUNT INVESTMENT	NAME OF PROGRAMME
7	Scientists	9, 400, 000.00	SAMRC Research Capacity Development Initiative
11	Scientists	9,750, 000.00	SAMRC Mid-Career Scientists
1	MSc	100,000.00	Staff Development Grant
5	PhD	1,000.000.00	
3	Scientists	1, 507, 717.50	
19	Postdoctoral	6,650, 000.00	SAMRC Intramural Postdoctoral Programme
5	MSc	1, 229, 884.00	Bongani Mayosi-National Health Scholars Programme
47	PhD	18,128, 828.20	
3	MSc	480, 000.00	Biostatistics Capacity Development Programme
4	PhD	800, 000.00	
6	MSc	1,780, 000.00	International Masters in Vaccinology (IMVACC) Programme
15	PhD	10,311, 000.00	SAMRC Clinician Researcher M.D PhD Development Programme
8	MSc	800, 000.00	SAMRC Internship Scholarship Programme
20	PhD	4,000, 000.00	

THE RESEARCH CAPACITY DEVELOPMENT OFFICE IS ON COURSE IN IMPACTING AND MAKING A DIFFERENCE TO THE LIVES OF OTHERS

Early Career Scientist Convention

The SAMRC Early Career Scientist Convention (ECSC) is a prestigious annual event. It is a unique conference that brings together early career researchers funded by the SAMRC in different health research areas such as public health, mental health, non-communicable and communicable diseases based at different academic institutions throughout the country.

The theme for 2019 was "Progress not perfection: Balancing mental and physical health on your PhD journey".

RCD Grants Holder's Meeting

"The aim of the new RCD Grant Holder's Meeting is to highlight to the researchers the high value put on them by the SAMRC and remind them of the contribution that they make in assisting the SAMRC as it continues to excel in the delivery of its mandate." - Manager Dr Thabi Maitin

"The SAMRC's agenda to develop the next generation of health and clinical researchers has over the last couple of years positioned itself on a path of excellence and measurable deliverables that are in line with national goals and targets. Barring known challenges of budgets the future of the work of the Division of RCD looks bright and exciting..."

– Dr Thabi Maitin, the Division Manager of RCD.

Early Career Science Convention

Early Career Science Convention

RCD Grant Holder's Meeting to empower scientists who have been awarded grants to conduct health research

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
2. SAMRC/UCT Risk and resilience in mental disorders Research Unit
3. Non-Communicable Diseases Research Unit
4. Environment and Health Research Unit
5. SAMRC/Wits Rural Public Health and Health Transition Research Unit
6. SAMRC/Unisa Violence, Injury and Peace Research Unit
7. SAMRC/NWU Hypertension and Cardiovascular Disease Research Unit
8. SAMRC/UFH Microbial Water Quality Monitoring Research Unit
9. SAMRC Centre for Health Economics and Priority Setting Research Unit

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

ALCOHOL, TOBACCO AND OTHER DRUGS RESEARCH UNIT

Unit Director: Charles Parry

OVERVIEW

The Alcohol, Tobacco and Other Drugs Research Unit (ATODRU) evaluates the degree of substance use and abuse in South Africa. ATODRU aims to increase knowledge in order to propose policies to decision-makers and make recommendations to reduce alcohol, tobacco and other drug use (ATOD) in South Africa. Through the Unit's research, which identifies ATOD trends and the most effective interventions, it intends to reduce the impact of substance abuse on individuals and their communities.

HEALTH IMPACT

For the past 25 years, the South African Community Epidemiology Network on Drug Use (SACENDU) has continued to inform substance abuse policy development and planning at local, provincial and national levels, and to guide training and strategic planning at treatment centres. Data generated by SACENDU has raised important issues of barriers, and equity of access, to treatment and in some cases has led to the siting of new treatment centres.

The Service Quality Measures Initiative, established in 2008, has, in conjunction with stakeholders inside and outside of government, established a national set of indicators linked to a performance measurement system for substance use treatment service quality. This has been implemented in the Western Cape and Kwazulu-Natal and is being scaled up nationally. The information generated from this system has guided prioritisation of treatment services, workforce development and quality improvement initiatives. Of late, our research has been used to make sure that the best local and international evidence informs policy decisions around medicinal and recreational cannabis, up-scheduling codeine, the future of community health workers and their role in ensuring universal access to alcohol reduction interventions, as well as the place of health promotion within the context of National Health Insurance.

Policy and Practice

In 2018/19 we reported on a study which highlighted the high level of heavy episodic drinking (HED) in the Tshwane Metropole and the link between HED, certain drinking venues and container sizes (Trangenstein et al., 2019). In 2019/20 we have added to this research by showing that:

(i) drinking and negative consequences of drinking (as measured by the Alcohol Use Disorders Identification Test) among People Living with HIV (PLHIV) on ART is significantly negatively correlated with self-reported adherence to ART and positive correlated with viral load (Parry et al., 2019: a randomised controlled trial)

(ii) alcohol use significantly increases the risk of poor treatment outcomes in both drug-susceptible and multidrug-resistant TB patients (Ragan et al., 2020: a systematic review and meta-analysis), and

(iii) exposure to alcohol promotions and advertising through SMS and free offers when buying alcohol impacts on HED (Petersen et al., 2019: a cross-sectional survey).

The recommendations of these studies have implications for the health sector and beyond, namely calling for

ATODRU will continue to raise awareness of the harmful effects of alcohol, tobacco and other drug use at the individual and community level, and for the South African population as a whole. Our research demonstrates the association between these harms and poor mental and physical health, including the intersection with HIV and TB, intentional and unintentional injuries, and non-communicable diseases including cancer. We will investigate, robustly test, and advocate for evidence-based treatment, early intervention and prevention strategies to inform societal resilience to the potential harms of substance use. As we transition to a bio-behavioural research agenda, we will actively engage with both government and non-government sectors to translate our research into clinical and public health guidelines and inter-sectoral policies.

– Prof Charles Parry

(i) evidence-based population-wide interventions that address the structural drivers of heavy drinking and individualised interventions tailored to PLHIV at risk of HED, (ii) modifications to the treatment guidelines for TB patients who consume alcohol, (iii) progress with the Control of Marketing of Alcoholic Beverages Bill and (iv) the banning of free alcohol promotions.

If the latter recommendations are implemented and properly evaluated, this would also be in line with our call (Siegfried & Parry, 2019) for more primary research testing the effect of alcohol control interventions in Low- and Middle-Income Countries (LMICs).

DIGITAL TECHNOLOGIES FOR HEALTH

ATODRU has developed a performance measurement system, known as the Service Quality Measures (SQM) initiative, that assesses the effectiveness, efficiency, access to, and quality of substance use treatment. Since 2014, we have implemented this paper-based system in adult services in the Western Cape and we have piloted implementation in KwaZulu-Natal. Implementation involves the completion of three forms for people entering treatment: (i) providers complete the South African Community Epidemiology Network on Drug Use (SACENDU)'s admission form when service users enter treatment, (ii) clients complete the South African Addiction Treatment Services Assessment (SAATSA) towards the end of the programme, (iii) and providers complete a standardised discharge form once a client leaves or ends treatment. We are now moving towards transferring the system to an electronic platform. This will allow clients to complete the SAATSA off-site and may assist in obtaining feedback from people who leave services early.

In 2019, ATODRU formed a collaboration with the National Department of Social Development and the newly launched Jembi/SAMRC Collaborating Centre for Digital Health Innovation to develop a digital solution to monitoring the performance and quality of publicly funded substance use treatment centres in the country that will form part of the Integrated Justice digital system (IJS). Scoping for this digital solution has begun. When developed, the solution will be able to generate relapse and recovery rates by using unique patient biometric identifiers to understand patients' utilization of services (including number of treatment episodes, exit and re-entry into the system) and their use of other services provided by the Department of Social Development. It will also provide the Department of Social Development with real-time access to i) statistics on the characteristics of people accessing treatment and the type of substances they are using for each state-funded facility and province and ii) feedback on treatment quality that facilitates timely inputs into service improvement plans. In time, it will also allow us to link to other data collected by the IJS so the IJS has a better understanding of the state resource utilization (e.g. social grants, justice system) of people who access SUD services.

As part of Project MIND, a large cluster randomised trial evaluating different systems delivery of mental health counselling to people living with HIV or diabetes, we developed an innovative digital application to predict, monitor, and report trial recruitment. This application is geospatially enabled and allows trial investigators to better plan trial duration and associated budgeting before a trial commences, and for trial managers to identify and intervene at sites where recruitment is sub-optimal during the conduct of the trial. The application was developed in partnership with the Stellenbosch University Department of Industrial Engineering.

RESEARCH TRANSLATION

In terms of the general public, staff in ATODRU have been actively engaged with the media. This has included, among other things radio interviews, interviews for print media (newspapers and magazines) and television. Staff also wrote newspaper articles on the following topics:

- "Tackling SA's booze crisis needs practical upstream measures" (Business Day)
- "A fit of the vapers – the case against e-cigarettes" (Daily Maverick), and
- "Big Tobacco uses dirty tricks to contest draft bill) (Health-e News).

Staff also presented literature on the development of exercise interventions for substance use disorders at the Recovery Festival in Cape Town in September 2019, and wrote pieces for the South African Depression and Anxiety Group's Mental Health Matters on the benefits of structured exercise for substance use disorders and for the National Research Foundation Science Matters Magazine

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NON-COMMUNICABLE DISEASES RESEARCH UNIT

Unit Director: Andre Kengne

OVERVIEW

The Non-Communicable Diseases Research Unit (NCDRU) was formed in 2013, with the overall purpose of formulating and applying an integrated programme of research and capacity development in order to improve the understanding, detection, prevention and management of non-communicable diseases (NCDs), with a major initial focus on cardiovascular and metabolic disorders in South Africa.

The core function of NCDRU is to conduct research and research translation on NCDs, focusing at present on cardiometabolic diseases, and to some extent chronic kidney diseases (CKDs). NCDRU's research aims to generate reliable knowledge to improve the understanding of the burden and drivers of those conditions, adapt existing knowledge or develop context-appropriate solutions to improve the prevention, detection and control of those conditions in South Africa, and other countries with similar health challenges.

HEALTH IMPACT

The research conducted by NCDRU has contributed to mapping the emerging burden of NCDs in mixed-ancestry and African South Africans in the last 10 years. This has been achieved through two ongoing parallel research programmes initiated in two communities in Cape Town in 2008/09. These programmes have generated unparalleled data to inform and improve the application to population groups. By conducting this research in collaboration with universities and in particular the Cape Peninsula University of Technology (CPUT), NCDRU efforts have contributed to the development of more research resources, culminating in 2019 with the establishment of the first SAMRC-funded extra-mural research unit at this institution: The SAMRC/CPUT cardiometabolic health research unit. These programmes of research have supported and continue to support the training at Masters and PhD levels across institutions in Cape Town; and provided platforms for participation in major global initiative such as the NCD Risk Factor Collaboration (NCD-RisC), and for collaboration with institutions in Africa (Cameroon) and Europe (The Netherlands) through students and post-doctoral fellows exchange.

Policy and Practice

Research led by the NCDRU has been very informative in refining recommendations on vitamin A supplementation in the country. NCDRU-led project has evaluated liver vitamin A stores in under-5 children in the Northern Cape province who are exposed to multiple vitamin A interventions (viz. high dose vitamin A supplementation and food fortification), as well as additional vitamin A from sheep liver, a rich source of vitamin A. Results of this project showed that 64% of these children had excessive liver vitamin A stores, which increased to 72% after been given a high-dose vitamin A supplement. Too much vitamin A can be harmful, particularly in terms of bone development. Our findings were shared with the Department of Health (DoH) to start a discussion on scaling back of the national vitamin A supplementation programme for under-5 children to the age of 3 years, particularly in areas where sheep farming is prevalent and the children regularly consume liver. Successive meetings and information sharing with the DoH between 2018 and 2019 have resulted in the DoH deciding to implement a change in the policy with regard to routine high-dose vitamin A supplementation in the Northern Cape province (i.e. scaling back the number of supplements to only two supplements during the child's lifetime for this province, and up to 2 years of age only).

A programme has been set up of research that has built over time to shed light of the specificities of cardiometabolic disease risk in African South African women. Activities in this programme have included: 1) Investigating the determinants of type 2 diabetes risk in middle-aged black South African men and women, by dissecting the roles of sex hormones, inflammation and glucocorticoids; 2) Identification of the metabolic pathways that predict type 2 diabetes in black South African women; 3) Investigating the mechanisms underlying insulin resistance in obese black SA women; and 4) pilot-testing interventions to mitigate cardiometabolic disease risk in black South African women.

In the area of food environment and dietary quality in relation with NCDs, NCDRU has developed a programme of research to: 1) assess dietary patterns in relation to energy/nutrient intakes and nutritional quality in south African infants; 2) investigates the effects of small-quantity lipid-based nutrient supplements on linear growth, psychomotor development, anaemia, essential

fatty acids, iron status and morbidities in South African infants; 3) explore the sustainability of diets of households by linking nutrition, consumption patterns and land use (in terms of land requirements); 4) assesses the effect of improved supply of locally grown vegetables into local stores in combination with a nutrition behaviour change communication campaign on consumption of fresh produce by women in Limpopo and Mpumalanga provinces) 5) developing and testing lifestyle interventions aimed at reducing total energy intake and improving food choices and levels of physical activity with a focus on educators.

The CRIBSA study and the Bellville South study co-initiated in 2008/08 by NCDRU have generated evidence that have informed the development of an ongoing implementation trial of community-based diabetes prevention in high risk mixed-ancestry and black South Africans: the South African Diabetes Prevention Programme (SA-DPP).

DIGITAL TECHNOLOGIES FOR HEALTH

NCDRU has a large portfolio of diagnostic and prognostic research, which is one of the research fields currently driving technologies for health. Our research in this field has included validating and adapting existing tests, diagnostic and prognostic models, or developing new ones with improved accuracy, with a focus where possible on Africa.

At the global level, we have conducted detailed validation of risk models to predict incident diabetes, or cardiovascular complications in people with diabetes. This research has shown that with little adaptation, incident diabetes risk model development in Caucasians can accurately predict the future risk of diabetes in other Caucasians, therefore obviating the need to develop new models for each population. Regarding cardiovascular complications in diabetes, our research has shown that risk models developed at the peak of cardiovascular diseases were not accurate to predict cardiovascular disease (CVD) in contemporary population with diabetes. We have therefore developed (and subsequently updated) a new CVD risk model for people with diabetes, which has been made available as an online tool, downloadable application and handheld calculator for use in a physician's office.

At the regional level, our work has shown that risk models for predicting prevalent diabetes developed in Asians and Europeans where not effective in mixed-ancestry South Africa. We have therefore developed and validated the first African Diabetes Risk Score (ADRS). This new score has been incorporated (as a built-in application) into the electronic questionnaire currently used to screen participants for inclusion in the South African Diabetes Prevention Programme (SA-DPP). SA-DPP is an initiative of NCDRU aiming to develop a context appropriate model of community-based diabetes prevention for South Africa, using community health workers (CHW) as frontline implementers. Other disease areas in which we have developed, or tested prediction models include chronic kidney disease, tuberculosis and HIV.

Regarding diagnostic tests and instruments, our work has shown that haemoglobin A1 (HbA1c) and other alternative marker of glycemia (fructosamine and glycated albumin) were not accurate for diabetes diagnosis in African populations. We have demonstrated that diagnostic threshold (or risk combination) derived from Caucasians could not be uncritically applied to the African population, with application for instance to diagnosis of abdominal obesity, metabolic syndrome, and chronic kidney disease using various estimators of the kidney function. We have also shown that various point-of-care (POC) instruments for blood glucose measurement marketed in Africa were not providing comparable estimates of blood glucose, and that POC instruments for measuring HbA1c or total haemoglobin were not providing estimates within the range of those from the reference standard. The disappointing performance of alternative tests for diabetes diagnosis has motivated further research to uncover novel biomarkers. In this regard our research in the field of epigenetics has revealed novel microRNA associated with diabetes risk in mix-ancestry South Africa. Should this be confirmed in future studies, it could open avenues for the development of novel diabetes risk screening tests in our setting. NCDRU is also increasingly harnessing technology for risk reduction/prevention, with applications at this stage being the development of interventions delivered using mobile phones. For instance, SMS will be used for intervention maintenance in our SA-DPP study, while we are currently testing the effect of SMS adherence support for hypertension control in people with HIV and co-morbid hypertension. It is also important to mention that NCDRU has increasingly gone paperless for most research conducted in the unit, by relying for instance on PDA and electronic case report form for data collection.

RESEARCH TRANSLATION

NCDRU regularly interacts with the general public through mass media and other forms of community engagement activities, initiated either by NCDRU or at the request of the general public. For instance, at the request of a local church in the Belhar suburb in Cape Town, NCDRU organized in November 2018, a three-hour health promotion session on diabetes and NCDs at large. This session was attended by more than 150 parishioners who also had their anthropometric measurements done by NCDRU staff members. It is of note that Belhar is a community in which NCDRU and collaborators from Cape Peninsula University of Technology, have a research presence since 2008/09.

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ENVIRONMENT & HEALTH RESEARCH UNIT

Unit Director: Angela Mathee

OVERVIEW

The Environment and Health Research Unit investigates and delivers new knowledge on significant environmental hazards to the health of South Africans, especially the youngest and the poorest. We publish and use the knowledge generated to lobby for policies, projects and actions that make the South African environment cleaner and safer, for this generation and the generations of tomorrow. Our priority areas of research are:

- Climate change, public health and adaptation;
- Housing and health;
- Exposure to toxic substances, and investigation of the associated health implications.

HEALTH IMPACT

Since its formation, the Unit has continuously been adapting and transforming to respond to the changing environmental health profile in South Africa. Especially in an era in which our planet has been changing in a rapid and disquieting way, the E&HRU has been re-shaped through the initiation of a climate and health research programme and the development of capacity to initiate studies that will deliver information to help communities, especially the poorest, to adapt to a world likely to be increasingly hostile and disruptive going forward. Through our partnership with National and Provincial Departments of Health, we have contributed to the drafting of two successive National Climate Change and Health Adaptation Plans, and have mounted a series of studies that respond to the research needs identified therein, for example studies on the burden of mortality during and after temperature extreme events in South Africa.

Following the first World Health Organization Conference on Air Pollution and Health in 2018, where emerging information on the health impacts of worsening ambient air pollution on global health was delivered, the Unit has put in place strategies to increase its capacity for air quality and health research, including the acquisition of air pollution monitoring equipment and the establishment of memoranda of understanding with key research and technical partners.

Making Impact through Research

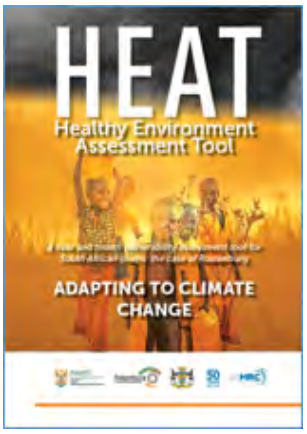
1. *Climate Change and Infectious Diseases: Early Warning Systems through the iDEWS Study*

Climate change is deemed the greatest threat to global public health in the 21st century. In southern Africa, where temperatures and rainfall are predicted to change significantly, the threat of infection from malaria, diarrhoeal disease and pneumonia is a pressing concern. Using climate-based modelling, informed by primary data from hospitals

and communities, climate-based models for the prediction of burdens of malaria and diarrhoea were developed and implemented for Limpopo Province, South Africa.

Although still in experimental mode, the predictions are being used to produce quarterly outlook reports. Arising from this work, the iDEWS (Infectious Diseases Early Warning System) Bureau was launched in 2019 at a side event of the National Science Forum. The Bureau is housed at the National Institute for Communicable Diseases (NICD) and continues to collaborate with iDEWS project researchers (including from the E&HRU) from around the world to run the predictions. These predictions have proven of considerable value, for example in the timing of spraying to reduce malaria incidence.

2. *Climate Change: Preparing for Heatwaves and Rising Heat in southern Africa (Vulnerability Assessment in South African towns)*



Average temperatures in southern Africa are predicted to increase by as much as 4 °C by the end of the 21st century. Concern is greatest for people living in settings of poverty, the elderly and very young, as well as those with pre-existing ill health conditions. In this light we have been supporting calls by the National Department of Health, contained in the Climate Change and Health Adaptation Plan for 2014-2019 and 2020-2024, for tools to assess national and local vulnerability to heat, and for towns and cities to prepare Climate and Heat Action Plans. Using climate predictions, the E&HRU identified Rustenburg, North-West Province, as a vulnerable town, likely to face heat-related health risks now and in the future.

Through a collaborative, intersectoral approach, a heat-health vulnerability assessment tool (HEAT) was applied and tested in Rustenburg. HEAT uses information from a town's Integrated Development Plan (IDP) and other readily available data sources to describe the heat risk and identify vulnerable groups and settings within a town. In Rustenburg for example, taxi ranks were highlighted as a particular setting of concern because of limitations in shade, seating and water access for users who often have to wait in line for long periods. The HEAT tool provides a simple, low cost approach to understanding heat-related risks for towns, and a basis for the development and resource allocation in Heat-Health action plans. A suite of heat-health awareness materials was previously developed by the E&HRU and is available online at :https://www.samrc.ac.za/intramural-research-units/EnvironmentHealth-resource-materials.

3. *The Growing Use of Unsafe Artisanal Pots in South Africa*

An emerging hazard studied by the E&HRU in the past year is the rapidly growing use of artisanal cooking pots in rural, and increasingly in urban, areas across the country. The pots are either imported from neighbouring countries, or are locally made by informal workers, usually in the home environment, using scrap metal. Users cite several advantages to using artisanal cooking pots, such as low cost, light weight, ease of handling and the need to use less wood fuel for cooking. There is public health concern that artisanal pots are not coated to prevent the migration of toxic metals into foodstuffs. Preliminary results from 2019/20 studies indicate high metal leaching rates. Aluminium for example, leached from all pots tested into an acetic acid solution approximating the acidity of a tomato-based meal at a mean level of 509 mg L-1 [more than 100 times the maximum permissible level for cookware stipulated by the European Union (EU)]. Each of 20 artisanal pots was tested three times, and leaching of lead exceeded EU recommendations in 55%, 60% and 45% of cases in round 1, 2 and 3, respectively. Similarly, tests for arsenic showed that levels exceeded EU levels in around 20% of pots in the first round of testing, but by the third round of testing complied with EU recommendations. Transmission electron microscopy revealed significant changes in surface structure of artisanal pots after cooking. We have begun evaluations of interventions to render the use of artisanal pots safer. Preliminary results point to the acidity of foodstuffs potentially playing an important role in leaching of toxic metals into foods. The artisanal pot making process is also potentially associated with local contamination of the environment.

FOURTH INDUSTRIAL REVOLUTION

Using Big Data to solve Environmental Health Challenges in South Africa

Gathering the evidence base to inform decision-making and policy development in environmental health and related areas, such as housing in South Africa is critical. By using "big data", the E&HRU has previously been able to generate robust information about the impact of very hot and cold temperatures on mortality in South Africa. Using data on 8.8 million deaths over a period of 20 years and calculating several lag periods between the day of exposure and death, we determined that about 3% of deaths in South Africa were associated with very cold days and 0.4% with very hot days. The effects of cold temperatures were longer lasting compared to heat, which tended to have an immediate effect. The strongest associations were for children under 5 years of age, the elderly (older than 64 years) and for people with cardio-respiratory ill health conditions. Currently heat alerts issued by the South African Weather Service are temperature-, rather than health-based. We are now further analysing the large data set of 8.8 million deaths to develop, for the first time in South Africa, health-based temperature cut-offs,

which could form the basis of early public health warnings for specific age and ill health categories, associated with predicted episodes of extreme heat and heatwaves.

Another large dataset which the EHRU is working with, in collaboration with the City of Tshwane and the Department of Family Medicine of the University of Pretoria, is the Community Oriented Primary Care dataset of approximately 400 000 participants, mainly living in Gauteng. Starting in 2014, 23 ward-based outreach teams administered questionnaires to all participating and consenting households. The questionnaire focused on six priority ill health conditions: child health, maternal and neonatal health, tuberculosis, HIV, non-communicable diseases and hepatitis. Questionnaires also collected data on household and dwelling characteristics, selected environmental exposures (such as fuel used for cooking) and resilience/food security. E&HRU scientists have begun to analyse the data to consider the socio-environmental and economic determinants of health in relation to the prevalence of tuberculosis.

RESEARCH TRANSLATION

At national level, the Unit is transforming its approach to research translation, with particular emphasis on inter-sectoral action. In 2020, a series of quarterly, informal intersectoral conversations was initiated with national and provincial departments, with the aim being to bring emerging research findings to the attention of policy makers in sectors whose policies and decisions may have a downstream impact on public health, including for example housing, environment, minerals and energy, water and sanitation (in addition to the health sector). While still at an early stage, the results thus far have been very encouraging, with new joint projects being initiated as a result of the discussions. This conversational approach to research translation will be evaluated during 2020/21 and will likely form an important pillar of E&HRU efforts in the future.

"The COVID-19 pandemic has come as a shock to the world, crippling economies and health systems, and demanding of us all that we step up and contribute in any way that we can to controlling the disease. The SAMRC demonstrated its agility in mounting, in a matter of weeks from the first case in South Africa, a team of six research units to design, implement and evaluate an environmental (wastewater) monitoring programme that gives public health departments one to two weeks advance warning of rising COVID-19 cases in local communities. This advance warning gives health officers invaluable time to prepare and intervene to curb transmission of the disease. Going forward, we will expand our wastewater epidemiology and technology programme to achieve additional public health benefits, for example in the fields of pollution monitoring and emergence of other infectious diseases."

– Prof Angela Mathee

Specific examples of research translation in the past year, include the work undertaken with the Gauteng Department of Health to co-develop training materials and a training course for Environmental Health Practitioners (EHPs) in South Africa on Climate Change and Environmental Health. The course will focus on emerging concerns in climate change, indicators and critical actions, and is scheduled to commence in May 2020. A further example of a specific research translation project followed a request from paediatricians at the Rahima Moosa Mother and Child Hospital (RMMCH) in Johannesburg to assist with an outbreak of Hepatic Sinusoidal Obstruction Syndrome (HSOS) amongst very young children located specifically in the town of Carltonville. Gauteng. Twenty-five cases of HSOS, which has a very high fatality rate (in this case 28%, though the figure may be higher since a significant proportion of the cases was lost to follow up) had been identified in the area over a period of 10 years. HSOS is predominantly caused by certain cancer treatments or poisoning by traditional herbal medicines prepared from Senecio family plants, some species of which are highly toxic and difficult to distinguish from safer varieties. E&HRU researchers were able to trace the source of the poisoning to a herbal remedy supplied by a single traditional medicine trader in Carltonville. Amongst other recommendations, an awareness campaign was suggested, for which a public information leaflet was drafted by the E&HRU scientists.

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SAMRC/WITS RURAL PUBLIC HEALTH AND HEALTH TRANSITION RESEARCH UNIT

Unit Director: Stephen Tollman

OVERVIEW

The Rural Public Health and Health Transition Research Unit works closely with host communities and local institutions to better understand and respond to the dynamics of health, population and social transitions in rural South and southern Africa, in order to mount a more effective public health and social response and thereby inform national, regional and global policy.

A robust, health and socio-demographic surveillance system provides an exceptional longitudinal platform for observational and intervention research along the life course. New technologies enable digitally based interventions, genomic and patient-oriented clinical research. As a founding SAPRIN node, the Unit contributes to health and sustainable development through supporting Depts. of Health, Education, Social Development and Science and Innovation, Statistics-South Africa and Planning, Monitoring and Evaluation in the Presidency. The Unit provides advanced research training and early/mid-career development opportunities.

HEALTH IMPACT

The Agincourt unit ensures the SAMRC brings the best science to bear on the health and wellbeing of rural populations in South and southern Africa, so contributing vital evidence on settings that harbour profound inequalities. Based on a rigorous, longitudinal population-based platform spanning socio-political change and the HIV/AIDS epidemic, the Agincourt health and

sociodemographic surveillance system covers a 'whole population cohort' of ~120,000 persons. The platform now covers genomic, physiological and clinical data. Nested studies, cohorts and trials along the life course include children (respiratory infections, development), adolescents (HIV/AIDS, NCD risk, mental health) and older adults (multi-morbidity, cognitive change), with a focus on socio-environmental exposures (education, labour migration, socio-economic status).

Technologies, until recently the preserve of urban or high-income societies, are central to several studies: smartphone App to deliver intervention against depression in adolescents; DXA measurements for osteoporosis; MRI scans for dementia. The Unit partners with research centres elsewhere, e.g. African Research in Kidney Disease (ARK) with Uganda and Malawi, collaborates with leading African, UK and US institutions, and provides leadership to sub-Saharan research networks. The Unit builds capacity of local staff, has a data intern programme, and supervises/mentors' doctoral students, postdoctoral fellows, early and mid-career researchers.

Policy and Practice

Research-to-policy

Impact of Unit research on policy and programmes occurs at several levels – illustrative examples include:

At population level: Working with PRICELESS, Agincourt verbal autopsy data on deaths from stroke were used to model deaths averted and cost savings from reduced salt content in foods that informed government regulations (2016 and 2019) to restrict the salt content of designated foods.

Health care system: Agincourt subdistrict clinics served as a national pilot for evaluation of integrated chronic care systems. Current work is piloting 'behavioural activation' to enhance adolescent mental health. Strengthening and validating national data: Triangulating Agincourt surveillance data with national census data to interpret migration patterns; calibrating Statistics-SA vital events registration, especially mortality and cause-of-death data; providing information on child deaths at home to National Committee on Morbidity and Mortality in Children under-5 (CoMMIC). At individual level: Data on poor rural access to child support grants led to Home Affairs introducing 'imbizotjies' and mobile offices to increase access to official documents – which resulted in much improved uptake of child support grants. Global / WHO: Providing a testbed to develop automated verbal autopsy tools for consistent, timely cause-of-death determination in routine vital registration.

Influence on further research/innovation

In the Unit's adolescent portfolio: HPTN 068 – trial of a cash transfer conditional on school attendance to reduce HIV incidence – revealed high levels of depression. Secondary analysis of these data showed that depression itself could lead to HIV acquisition (Goin 2019). These findings prompted current work to develop and pilot an App-based intervention for depression in rural adolescents supported by an SAMRC/UKMRC/Newton grant. Work is a partnership between the Unit and Oxford University, with the Universities of Limpopo, UCT, Cambridge, Exeter and UCLA. Building capacity and use of new technologies are specific goals.

In the Unit's adult health and ageing portfolio: The HAALSI study – Health and Ageing in Africa: Longitudinal Studies of an INDEPTH Community – examined cognitive ageing using established paper-based measures alongside innovative tablet-based measures more attuned to low literacy, low numeracy populations. This paved the way for a new NIH-funded Dementia study in rural South Africa, with a full neurological examination and MRI scan in a subsample at varying levels of cognitive function. MRI scans are conducted at Kiaat Private Hospital in Nelspruit, establishing a productive partnership with the private sector. The Unit operates through highly collaborative networks of national and global excellence. By linking scientists tackling the critical triad of cardiovascular, metabolic and renal disease, the Unit is conducting a major evaluation of the impact of government-led salt regulations on rural population health outcomes.

DIGITAL TECHNOLOGIES FOR HEALTH

Now fully e-based and digitised, Agincourt health and socio-demographic surveillance – extending from genomic to family/household platforms – provides a dynamic system for generating highly integrated longitudinal data as a basis for new hypotheses, discovery and strategic research as well as testing of cutting-edge technologies. Providing a gold-standard, the system also presents an opportunity to calibrate sub-district findings with larger-scale district or provincial analyses – initiatives underway

with Mpumalanga and Stats-SA. As well as ensuring public access to key datasets such as HAALSI, we are pioneering approaches to data sharing whereby globally networked research teams together review a common dataset (thereby overcoming an outdated idea of 'data transfer' from lower to higher-income centres).

The Unit has a track-record of decentralised health systems R&D informed by rigorous data on population and household structure, all-cause mortality and cause-of-death, childbearing and reproductive health, and migration and employment patterns. Linkage of population-based data with data from routine service delivery records (such as clinical, laboratory, education and social grants) provides a rare opportunity to leverage advanced data management and analytic techniques to enable multi-level investigation of disease and health outcomes along the life course, and their biological, social, economic and environmental determinants and consequences. We expect e-records suited to rural primary care systems to be an example of spin-offs.

The Unit's research has a growing focus on evaluating the effectiveness of digital technologies in improving individual health and wellbeing. Studies to investigate the effectiveness of digital technologies in helping patients monitor and manage chronic conditions include:

i. evaluating the effectiveness of low-end smartphones to deliver a tailored psychological therapy, Behavioural Activation (BA), to adolescents 15 to 19 years to reduce depression;

ii. tablet-based cognitive testing of older persons that lowers educational and linguistic barriers; and

iii. assessing the impact of digital technologies for self-monitoring of personal health markers such as physical activity and sleep (activity trackers), weight (weighing scales), blood pressure (blood pressure monitors) and glucose (glucometers), on health outcomes among individuals with chronic health conditions.

Unit research on the use of digital technologies for health, co-developed with local communities and in partnership with district and provincial health services, in combination with the digitisation of health records from a network of clinics serving the Agincourt population, can support the tailoring of healthcare to individual needs.

RESEARCH TRANSLATION

The Public Engagement Office (PEO) organises knowledge dissemination interventions, key to which are feedback and discussion of research findings at village meetings with regular production of tailored knowledge products such as village 'fact sheets' to support local development initiatives. Each household regularly receives a 'fact sheet' containing study findings specific to their village.

More targeted meetings are held with local service providers to discuss research protocols, study results and implications for programmes and service provision, as well as experience of research activities in the area. Key to the work of the PEO is ongoing networking with local, district and provincial service providers, decision makers and policy implementers to ensure that study participants are referred to appropriate care when needed, and that relevant stakeholders are consulted during community entry and feedback. The PEO has established a Community Advisory Board (CAB) with elected representatives from each village in the Agincourt study area. CAB members have ongoing training and meet monthly to discuss research projects. Project-specific Research Advisory Groups (RAGs) are established for large studies.

Principal investigators and project managers work with the PEO to disseminate research findings more broadly, including reports to the Mpumalanga Department of Health Research Committee, single-page fact sheets from academic publications to distribute to research and NGO collaborators, the public and service providers through email, and providing printed copies at meetings. Links to peer-reviewed publications are disseminated through Twitter. An annual newsletter is used to highlight key research results and Unit activities to all stakeholders. In 2019 we produced several articles in The Conversation Africa some of which were highly ranked; among these were two newsletters devoted to Migration and Health, and Ageing, Health and Inequalities.

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SAMRC-UNISA VIOLENCE, INJURY AND PEACE RESEARCH UNIT

Unit Director: Mohamed Seedat

OVERVIEW

The Unisa/SAMRC Violence, Injury and Peace Research Unit (VIPRU) is a strategic partnership between the University of South Africa and the SAMRC. The mandate of the unit is aligned to that of the SAMRC and is to improve the population's health status, safety and quality of life through transdisciplinary safety and peace promotion research aimed at preventing death, disability and suffering arising from violence and unintentional incidents of injury.

VIPRU serves as a national research and development hub that seeks to centre and shape the research agenda on violence and injury prevention, and safety and peace promotion. It is focused on several strategic prevention research niche areas, VIPRU seeks in particular to contribute to the development of a multi-disciplinary South African science of intervention, implementation, and evaluation; through: (a) the implementation of transdisciplinary violence, injury and peace research; (b) contributions to contextually-sensitive prevention sciences; (c) cultivation of innovations and technologies in support of safety research and knowledge applications; (d) building and transforming preventative and promotive capacity and expertise; (e) maintaining demonstration initiatives to support research, capacitation and knowledge brokerage; and (f) encouraging the use of research to champion prevention and promotive policy and practice.

HEALTH IMPACT

VIPRU has highlighted the primary prevention of injuries, with an emphasis on promoting positive conditions that prevent injury before it occurs. Primary prevention is a priority for South Africa because of the opportunities for controlling preventable risks, the relative lack of such measures, and the relative, advantageous cost-benefits of primary prevention measures. VIPRU has centred its recent efforts on the development of a local evidence base to support multi-disciplinary, ecologically aligned public health interventions.

This was in the South Africa Lancet Series: "Violence and injuries in South Africa: Prioritising an agenda for prevention". This work appealed for a national strategy to address violence and injuries based on evidence of effectiveness, calling for further investigation into the magnitude and nature of the problem, research into common determinants and supportive institutional factors, development of assessment and monitoring methods to support empirically-based violence and injury prevention interventions, and expansion of systems to monitor intervention effects. The Lancet Series was followed up by "Health in South Africa: Changes and Challenges since 2009" that reviewed the progress of health, including injury prevention research, since 2009. This highlighted the widening social and racial disparities and drivers to health

and safety, ongoing health and social system challenges, limited national surveillance and information, and systemic barriers to scaling up of innovative interventions.

Policy and Practice

VIPRU's intervention focused stance has recognised the insufficient debates about the influences of Euro-American-centrism on research, training and teaching, and as re-centred by the recent calls for decolonisation, the VIPRU orientation to scholarship also considers what constitutes relevant and appropriate Africa-centred intervention sciences. This is in particular reference to public health and psychology, which are both crucial disciplines for violence and injury prevention, and safety and peace promotion, but have tended to be largely acontextual, with training modalities limited to small groups of students who are trained to work primarily with individuals, and with a restricted public reach. Given the status quo in intervention disciplines, there is a niche opportunity to engage in work that re-thinks what constitutes appropriate and relevant intervention sciences, and remodels intervention practices. Such conceptual work has sought to transform the assumptions and epistemic claims that have come to determine intervention disciplines in Africa, and thus to undertake conceptual and theoretical work that is required to comprehend what constitutes Africa(n)-centred intervention disciplines.

Despite the great deal of investment made towards supporting implementation studies on violence and injury, the study of community engagement and the evaluation of community engagement models has remained a marginal focus area in the violence and injury sectors, and more broadly too, with insufficient understanding of what constitutes meaningful engagement, and of participatory approaches to the design, implementation and evaluation of community engagement models. Prevention agencies therefore continue to be overly reliant on approaches emerging from the Global North that have not been adequately evaluated for local cultural and social specificities. There is consequently a need for empirical programmes that demonstrate the development of community-engaged approaches and models of violence and injury prevention that consider the context-specific ecology of sustainable implementation, including the associated dynamics and capacitation prerequisites, as well as technologies and interventions that work in context. VIPRU thus hosts a number of Demonstration Programmes to showcase best-practices for the simultaneous development, implementation, and evaluation and associated improvement of particular locally situated approaches to violence and injury prevention and peace promotion. Demonstration Programmes may be used to develop, implement and evaluate interventions, including technologies that address a specific pre-identified problem and mobilise material and other resources to support the sustained rollout and continued improvement of such interventions.

DIGITAL TECHNOLOGIES FOR HEALTH

VIPRU has contributed to the development of information systems and innovation to strengthen the provision of accurate, reliable data and data systems:

- In South Africa, the National Injury Mortality Surveillance System or NIMSS provides the most detailed source of information on the 'who', 'what', 'when', 'where' and 'how' of fatal injuries, and with a database of over 350 000 cases provides a strategic, operational and research platform for a range of Government ministries and other stakeholders across the country.

- The NIMSS provides a surveillance platform in support of the South African National Development Plan for a 50% reduction of injuries and violence within its 'Health Care for All' development objective. It provides the basis for a public health surveillance system that is argued to be key to enhancements of population health, through its deliverance of data and information to enable quality decision-making and effective, appropriately targeted actions.

VIPRU is currently leading the development of an innovative web-based system for the entry, collation and initial analyses and dissemination of injury mortality information. The eNIMSS is a response to the rapid increase of volumes of data, with public health agencies' electronic surveillance systems to increase the safety, quality, and the timeliness of information on non-natural deaths. The Electronic National Injury Surveillance System (eNIMSS) will thus collect more timely epidemiological data, which is essential for early identification of new injury trends and emerging problem areas. VIPRU is also currently hosting the development of other contextually appropriate and relevant instruments to assess, monitor and promote safety and peace, but specially at local communities. This Community Safety and Peace Index (CSPI) is directed at the paucity of community safety and peace indicators that may guide and inform the development, implementation, monitoring and evaluation of specifically community relevant and situated safety and peace promotion interventions. A mobile App will ensure public accessibility and wide public use of the CSPI, and support members of the public to digitise, record and report incidents that speak to the measures of safety and peace.

RESEARCH TRANSLATION

VIPRU led the development of several strategic frameworks to guide the implementation of evidence-based safety interventions, one at national level (i.e. Integrated Strategic Framework for the Prevention of Injury and Violence in South Africa, 2012-2016), and two in the Western Cape (i.e. Western Cape Strategic Framework for Fire and Burn Injury Prevention and the Western Cape Drowning Prevention and Water Safety Strategy). These followed the VIPRU presentation at the 2011 National Health Research Summit, where VIPRU presented at the invitation of the NDoH a strategic analysis of research into violence and injury prevention in South Africa. This analysis drew on the VIPRU publications in the Lancet South Africa Series, precipitating multiple national and provincial collaborations, including VIPRU hosting with the SAMRC, UNISA and Foundation for Professional Development, the 1st Violence Prevention Conference, held in 2016 in Johannesburg.

VIPRU has also hosted a number of other specialized formats, including the "Crime, Violence and Injury in South Africa Series". Three Issues have thus far been published, with the most recent "Crime, Violence and Injury in South Africa: 21st Century Solutions for Child Safety" in 2012. This comprised 16 chapters directed at child safety advocates from national and local government, community-based organisations, researchers, practitioners, and students. VIPRU also produced a number of Policy Briefs, e.g. in 2016, VIPRU published a Policy Brief on gender (in)equality in the home and called for the strengthened programming and policy-making directed at the promotion of gender equality within families, to disrupt harmful gender relations. Another Policy Brief, on the representations of men in South African violence prevention policy, called for greater recognition of men as a group vulnerable to violence, and severe forms of violence in particular, while continuing to develop policies and programmes which focus on women and children as vulnerable to violence victimisation. These Briefs were disseminated widely, and specifically sent to all relevant National Government Departments.

VIPRU has also intensified its use of modern media engagement, with a significant public user impact. Staff have actively responded to media requests across multiple platforms, with staff considered sought-after social commenters on e.g. violence and masculinities. The social media platforms have had extensive reach. For instance, for the period June 2017-October 2018, the African Psychology YouTube channel registered 9570 views; for the period May 2017-October 2018, its top Facebook post reached 1718 people; and its Tweets earned 2600 impressions in October 2018.

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Mobilising Science, Technology and Innovation to Inform Activism-Driven Action

The 2020 COVID-19 pandemic has highlighted the longstanding and deep social, health and economic inequalities in South Africa. Inequalities manifested in increasing burdens of violence and injury, disproportionately sustained by vulnerable communities at home, educational settings, recreational spaces, and on South Africa's transport routes. Our work draws from crucial knowledge traditions while mobilising technology and innovation to inform and drive activism-driven programmes of risk and harm detection, primary prevention and protection of vulnerable communities, and targeted recovery support.

– Prof Ashley van Niekerk

SAMRC/NWU HYPERTENSION AND CARDIOVASCULAR DISEASE RESEARCH UNIT

Unit Director: Aletta E Schutte

OVERVIEW

Over the past five years, the Unit: Hypertension and Cardiovascular Disease (CVD), has been in a constant state of transformation. This included strategic efforts to renew and adapt our research focus to better address the significant burden of hypertension and consequent cardiovascular mortality in South Africa. 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 raised blood pressure in children and young adults, and to focus on the unique disease profile of a large proportion of South Africans affected by co-morbidities in terms of HIV and CVD.

Aligned with sharpening our research focus, our staff complement has shifted towards a young generation of researchers, including more women and more black staff members – empowered to lead these initiatives going forward (e.g. by doing international fellowships in expert laboratories).

HEALTH IMPACT

Research conducted by the Unit encompass continuous direct interaction with the community. From direct community interaction by visiting community members at their homes, workplaces or young research participants in schools – to connecting via social media, the Unit strives to connect with the community whilst transforming the cardiovascular health scene within South Africa. Not only did the Unit transform its staff complement, research approaches, projects and funding over the past years, it also transformed its outreach towards the community.

With our research which uses the latest technology such as polyomics and advanced cardiovascular phenotyping, we contribute to original cardiovascular profiling. Our approach to focus on a life course strategy of CVD development, targets the African youth. This novel focus has the potential to result in lower absolute numbers of adults developing strokes, heart and kidney disease in later life – reducing the number of hospitalisations and burden on the healthcare system.

In addition, we realise that a large proportion of South Africans suffer from co-morbidities, such as infectious and cardiovascular diseases combined – which also requires specific attention. Our contributions of novel data and

Our aim is to closely link and integrate various disciplines and international centres with the relevant expertise to become the premier research centre for CVD research in Africa, and to deliver research outputs that have potentially important implications for Africa and the world with respect to the early identification, risk estimation and ultimately prevention of CVD. This will be achieved by translation of our findings to national health policies and in the roll out of evidence-based education programmes and prevention strategies. These practices should be tailor-made to the South African context e.g. taking cultural diversity into account; making use of locally available foods affordable to the broader public; consider the specific genetic make-up of the different South African ethnic groups and taking the co-existence of infectious diseases and the metabolic sequelae of their treatment into account.

– Prof Marlien Pieters

analyses in research publications aim to contribute towards better population-based CVD prevention, but also better treatment and care for South Africans.

Policy and Practice

The Unit's contribution to South African policy changes include the salt legislation to reduce the amount of sodium in a range of processed foods. Together with the WHO SAGE study, the Unit contributed to a national study to monitor the sodium intake in South Africans before and after the legislation has passed. Additionally, based on 24-hour urinary sodium analyses from the African-PREDICT study, estimations on South Africans' salt intake were made to inform the Department of Health.

Further research and innovation within the Unit include ongoing data capturing and participant examinations in prospective studies to better understand the detailed pathophysiology that underpins early vascular aging and CVD development in Africans.

These approaches are based on earlier findings from the PURE study where we highlighted that CVD and hypertension develops early in life with extremely high percentages of South Africans suffering from CVD. By using novel approaches to identify these in early life, our ongoing research will address this important aspect.

DIGITAL TECHNOLOGIES FOR HEALTH

The advantage of working in this era is access to novel approaches. In at least three of our projects we incorporate the omics approach, ranging from detailed metabolomics, proteomics, transcriptomics and genomics. Integrating these polyomics with extensive physical, biochemical, psychological and clinical biomedical measurements (taken across several time points) is only possible by using next generation technologies that allow the analysis of big data, including machine learning and deep learning technologies.

Several doctoral students are working on these data sets in close collaboration with international experts in Glasgow, Hanover, and new contacts made with the Centre for Big Research Data in Health at the University of New South Wales in Australia (https://cbdrh.med.unsw.edu.au/).

The Unit has collaborated closely with the International Society of Hypertension's global hypertension awareness campaign, named May Measurement Month, which screened over 4.5 million volunteers between 2017-2019. By using mobile App technologies to capture data, we can reach the global population, enter and access their data. Similar technologies can potentially be used in South Africa and other low- and middle-income countries where mobile phone access is now a reality – to increase adherence and monitoring.

RESEARCH TRANSLATION

Scientists and researchers from the Unit continuously interact with the media (online, print, radio and television) to both inform the public regarding general aspects of raised blood pressure/hypertension, and to translate research findings to the general public and other stakeholders.

The following topics were covered on publications such as The Conversation, News24, Cape Times:

(i) Salt is bad for you: but how it affects your body is still frontier science

(ii) The new threshold for treating high blood pressure

(iii) The rise of obesity as cardiovascular risk factor in South Africa

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SAMRC/UFH MICROBIAL WATER QUALITY MONITORING RESEARCH UNIT

Unit Director: Al Okoh

OVERVIEW

The Microbial Water Research Unit 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 proffering 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".

HEALTH IMPACT

Since its inception, the Unit's research activities have been driven by the national imperative that recognizes that South Africa is in a "frozen demographic" in Science and Technology; and in our case, the serious problem of shortage of skilled manpower in the water and sanitation sectors, especially amongst previously disadvantaged demographic groups in the country, with the Eastern Cape Province (ECP) having a fair share of this challenge.

We are also mindful of the effect of water and sanitation on public health and consequently on poverty alleviation, and the research unit is obliged to assisting in finding solutions to this and other challenges in the water and sanitation sectors through capacity development and production of skilled critical mass in water quality science and management, and public health microbiology which are urgently needed in the sectors. To achieve this aspiration, our research agenda has prioritized such focal themes as water/wastewater quality and genomics, including related emerging infectious diseases and survival of the pathogens; emerging chemical pollutants and their health implications; reservoirs of antibiotic resistance; and new bioactive compounds of health and biotechnological importance.

Guided by the SAMRC's strategic goals 2 and 4, the work of the Unit supports the objectives of the National Water Act, 1998 (Act No. 36 of 1998), and the White Paper on Science and Technology. The two recognizes that South Africa is in a state of "frozen demographics" with respect to skills and capacity development in Science and Technology. Our work in the Eastern Cape, which is mainly rural, and that our students are mainly from the previously disadvantaged demographic groups speaks to these strategies.

Also, in order to help government to address the triple challenges of poverty, unemployment and inequality in the country, over 60 Masters and Doctoral students have graduated from projects in our Unit, making them competitive in the job market. All graduates from the Unit have either gained employment or are pursuing higher degrees and thus have assisted in breaking the shackles of poverty in their families.

Policy and Practice

Our research agendas have no doubt contributed to the knowledge economy in South Africa and globally and our outputs in our various research thrusts have been veritable resources in influencing further research. A summary of these major research contributions include:

Quality indices of aquatic resources in the Eastern Cape Province and emerging challenges in the water sector. In one of these studies, we assessed the prevalence, viro-distribution patterns and predictive disease modelling of Plesiomonas shigelloides in selected freshwater resources, as well as the incidence and distribution of Acinetobacter species in selected freshwater environments in the Amathole and Chris Hani District Municipalities. Results showed:

- From the application of in silico pathogenomics assessing virulence traits in P. shigelloides, 134 unique open reading frames homologous or orthologous to virulence genes were identified and 108 pathogenicity islands were also found;
- the aquatic resources of the study communities are important reservoirs of pathogenic Acinetobacter species (A. baumannii and A. nosocomialis) and antibiotic resistance determinants, suggesting the need for more studies in this area.

Furthermore, we assessed the quality indices of recreational water resources in the ECP and concluded that:

- Anthropogenic activities still play a role in the contamination of aquatic environment thereby compromising the quality of our water resources occasioned by inadequate sanitary infrastructure; and
- the quality status of this recreational water fell short of acceptably standards and consequently is a threat to public health in many cases.

COMMUNITY ENGAGEMENT INITIATIVE AND RESEARCH TRANSLATION

Our Unit was also involved in community engagement (CE) initiative, where we carried out quality assessments of borehole water of the University of Fort Hare, Alice main campus and our findings indicated the presence of a huge quantity of underground water but high counts of coliform bacteria and high levels of lead, which are of high risk with respect to human health, and so disqualifies the water for drinking or other domestic purposes without treatment. This work provided baseline data for the University's ongoing plans to explore the groundwater resource in view of the challenges of a shortage of water on the Alice campus and town.

The SAMRC Microbial Water Quality Monitoring Centre has established itself as a dependable hub for the development of the next generation of experts in the water, sanitation and environmental genomics cluster. In the next five years, our Unit will continue its upward trajectory in knowledge generation and proffering solutions to the myriad of challenges facing the water and sanitation sectors, with focal themes on quality indices of water/wastewater milieus, reservoirs of antimicrobial resistance, emerging biological and chemical toxicants in the aquatic environment, and bioactive compounds of health and biotechnological importance. Through this initiatives, we hope to be a major contributor to skills and capacity development in the water and sanitation sectors especially amongst previously disadvantaged demographic groups in the country which is a priority for the South African Government.

– Prof. Anthony I Okoh

Antimicrobial resistance in the food-water-agricultural products nexus

The increase in the occurrence of antimicrobial resistance (AMR) has become a major public health concern worldwide and one of the focus in our Unit is intensive investigations of AMR bacteria and ways of controlling or removing antimicrobial resistance determinants in the environment. Under this subgroup, we evaluated the incidence and antibiogram fingerprints of several bacterial pathogens recovered from recreational water, hospital effluents, wastewater treatment plants effluents, meats, vegetables, foods and milk samples in the Eastern Cape Province. Our findings revealed high incidences of important pathogens including ESKAPE pathogens, Listeria species and members of Enterobacteriaceae family with multiple antimicrobial resistance including against the carbapenems. Several articles have been published from these projects.

Clinical Pathogens

Our Unit was actively involved in a series of fascinating research on clinical pathogens including bacterial, protozoan and HIV. Our HIV/AIDS studies investigated the socio-demographic and clinical determinants of late presentation among patients that were newly diagnosed with HIV in the Eastern Cape, South Africa (Sogbanmu et al, 2019). Another study evaluated HIV-1 drug resistance among parturient women on anti-retroviral therapy in the ECP, while the third is a cross-sectional study on diabetes mellitus in newly diagnosed HIV-positive patients in Buffalo City Municipality, East London. An analysis of HIV-1 integrase gene sequences among treatment-naive patients in the Eastern Cape, South Africa was also carried out (Digban et al., (2019) as well as on transmitted drug resistance among the drug naïve patients (Digban et al., 2019).

Water Chemistry

The increase in the incidence of antibiotic resistance has become a major challenge globally. We embarked on employing innovative technologies involving advanced oxidation and adsorption processes in the presence of novel nanomaterials for the removal of nucleic acids (and consequently ARG) and endocrine destructing chemicals (herbicides and dyes) from wastewater.

Also, embarked upon several studies bordering on the occurrence, spatiotemporal distribution and health risk assessment of a number of persistent organic pollutants in the aquatic resources in the Eastern Cape Province, especially in areas with a history of gross chemical and

industrial pollution. Amongst the list of our contaminants of concern are polycyclic aromatic hydrocarbons, organochlorine pesticides, polybrominated diphenyl ethers (PBDEs), polychlorinated naphthalenes (PCNs), BPA (bisphenol A), organophosphate flame retardants (OPFRs), heavy metals and some pharmaceutical and personal care products (PPCPs).

Bioactive compounds

Our studies on Chlorella sorokiniana and Chlorella minutissima, Ecklonia maxima, Gelidium pristoides, Ulva rigida and Gracilaria gracilis revealed that these algal species are a potential source of bioactive agents or nutraceuticals for the management of neurodegenerative diseases. This study has received generous funding from the Technology Innovation Agency (collaboration between University of Fort Hare and UKZN) for escalation and further studies towards commercialization.

DIGITAL TECHNOLOGIES FOR HEALTH

Our research has made significant contributions to the body of knowledge on the fate and distribution of key microbial and chemical pollutants in the aquatic milieu. Our aspiration for the next 50 years within the context of 4IR is to build on our findings by developing real-time detection system for priority pollutants in the aquatic environment. This will involve application of biosensor technology that can be coupled with relevant digital platforms and smartphone systems for fast detection and reporting of target pollutants and their predictive risks in the environmental matrices.

RESEARCH TRANSLATION

Reports submitted to relevant agencies, including one report to the Water Research Commission. Findings also submitted to the managements of wastewater treatment plants and farms that authorized the Unit to use their sites as study locations. These reports help them in the management of their facilities. Findings also published in DHET accredited journals to reach a wider audience as well as to make presentations at national and international conferences.

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SAMRC/UCT RISK AND RESILIENCE IN MENTAL DISORDERS RESEARCH UNIT

Unit Director: Dan Stein

OVERVIEW

The Risk and Resilience in Mental Disorders Research Unit focuses on mental disorders. There is growing awareness of the high prevalence and costs of mental disorders; these conditions 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 a need to transform health services to address mental disorders.

The Unit's work ranges from basic neuroscience, on to clinical research, and from there to epidemiological and public mental health studies; that is from bench to bedside, and from the clinic to the community. The research ranges from contributions to nosology and epidemiology, to brain imaging and neurogenetics, and on to cohort studies and clinical trials and this diversity is appropriate, given the focus on transformation and impact. In order to elevate the quality of the work of the Unit, there is also a need for wide collaboration.

HEALTH IMPACT

The vast majority of neurogenetic and neuroimaging data derive from Caucasian populations; this ultimately runs the risk of further increasing health inequalities. During this reporting period, the Unit has continued to contribute to international collaborations on neurogenetics and neuroimaging. We have played a leading role in the largest neuroimaging studies of OCD to date, as well as in novel work on the overlap of genes that increase risk for PTSD/anxiety with genes that increase risk for changes in neural circuitry.

During this reporting period, the Unit continued to publish findings that range from basic science through to community health and including work on clinical interventions in the local setting. A publication in Science provided new insights into the genetics of schizophrenia. The Unit Director played a key role in editing a volume on global mental health and psychotherapy; this brings together a range of research in this area, including several innovative psychotherapy intervention studies recently undertaken in South Africa.

Policy and Practice

The Unit has continued to play a key role in work on the mental health chapter of the latest revision of the World Health Organization's International Classification of Diseases (ICD), the ICD-11. While the Unit has made contributions to the classification of obsessive-compulsive disorders, we also participated in a range of collaborative ICD-11 scientific publications, co-produced by leading Units around the world, which provide the scientific basis of the revision.

A key publication from the Unit during this year outlined the importance of integrating mental health interventions with management of other non-communicable diseases. This publication brings together a range of work relevant to this integration, including work from the Unit.

DIGITAL TECHNOLOGIES FOR HEALTH

The Unit is involved in several big data projects, including work on neurogenetics and on neuroimaging. Our Neurogenetics work involves collaborations with the Psychiatric Genetics Consortium, the largest collaboration on neurogenetics world-wide.

Our neuroimaging work involves collaboration with the ENIGMA consortium, the largest dataset of neuroimaging worldwide. We are also involved in work that attempts to integrate neurogenetic and neuroimaging findings. The research continuously contributes towards improved (digital) technologies for health - the Unit Director is currently working in the area of global mental health and m-health, editing a volume that summarizes work on digital technologies to enhance mental health in the low- and middle-income country contexts.

RESEARCH TRANSLATION

The Unit is particularly interested in African collaborations and during the reporting period, the Director helped convene the annual African College of Neuropsychopharmacology meeting in Kenya. The Unit has played a key role in the SA HIV Addiction Technology Transfer Centre, which provided training to hundreds of clinicians around the country on SBIRT (screening and brief interventions) for substance use disorders.

The Mental Health Information Centre of the Unit is dedicated to community engagement activities in the area of mental health.

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The slogan "no health without mental health" is helpful in emphasizing the extent of the burden of mental disorders, both in South Africa and globally. At the same time, there have been important advances in mental health, ranging from discovery research on the neuroscience of mental disorders, through to implementation research on best practices for disseminating treatments. Our Unit will continue to work in both these areas, aiming to integrate approaches in neuroscience and in global mental health, in order to help diminish the burden of mental disorders.

– Prof Dan J Stein

SAMRC/WITS CENTRE FOR HEALTH ECONOMICS AND DECISION SCIENCE RESEARCH UNIT

Unit Director: Karen Hofman

OVERVIEW

The SAMRC/WITS Centre for Health Economics and Decision Science-PRICELESS SA (PSA) is a woman led research unit, based at the School of Public Health at the University of the Witwatersrand, which engages with decision makers in setting health priorities.

Its research areas focus on the application of a wide range of tools - economic tools, policy analytical tools and public engagement tools – to inform decision making on the allocation of scarce resources within the health system. It focuses on the policies that produce the best buys for South Africa and sub-Saharan Africa through a small multidisciplinary team, with local and international partnerships.

PRICELESS SA is actively involved in teaching and development, and started a Masters in Public Health in Economics at the School of Public Health at WITS University. The first intake is writing their research reports in 2020, and the second intake started in 2020.

HEALTH IMPACT

PRICELESS SA's research focuses on setting health priorities in view of growing budget constraints. Transformative policy-relevant research over the past year has included an economic evaluation of the seasonal influenza vaccination programme in South Africa, an estimation of a cost-effectiveness threshold for South Africa, the evaluation of the SSB tax in South Africa and identifying nutrition-related priorities to impact positively on the growing epidemic of non-communicable diseases in South and sub-Saharan Africa.

In collaboration with researchers at Harvard University, PRICELESS SA is applying innovative tools like extended cost-effectiveness analysis, to understand which income groups will benefit the most from a health intervention. In addition, PRICELESS SA is developing an ethical framework for Health Technology Analysis (HTA) to support the integration of values and ethics into HTA decisions so that they are based on South African values as well as on cost effectiveness.

The Centre also researches within communities to enable them to make informed decisions about health services. This through adapting and implementing a tool developed in the US called Choosing All Together (CHAT). The work, in rural Mpumalanga involves engagement with communities and policy makers, costing a number of interventions and then engaging the community groups to select the interventions based on their needs and the relative cost of the interventions. This innovation enables the highest level of community participation in prioritisation of health services.

Policy and Practice

PRICELESS SA was able to provide the evidence for the restriction of salt in bread and other processed foods. This supported the National Department of Health in passing the regulations. The centre also has extensive modelling and analysis on the role of Sugar Sweetened Beverages (SSBs) on obesity and thus diabetes in South Africa. This evidence provided the basis for passing of the bill to place a tax on SSBs. It continues to research and monitor the sale of the SSBs, their formulation and the activities the key producers undertake to attempt to increase their market. PRICELESS SA is also involved with the UWC and the National Department of Health to understand the best method of food labelling to keep the public informed about what they are consuming in processed foods.

DIGITAL TECHNOLOGIES FOR HEALTH

Much of PRICELESS SA's research is using big secondary data sets such as the Gauteng Observatory Data or Kantar Data (data on sales and pricing) and the Centre is constantly looking at new ways to engage with big data to enable an understanding of the role of the industry in the food supply, advertising and production chain.

Social media is an important marketing stream for commercial determinants of health and PRICELESS SA is engaging in analyses to understand how social media is used to market unhealthy foods and drinks, and what policy options are available to deal with this.

The Centre continues to contribute towards improved (digital) technologies for health – as a unit looking at priorities and best buys, PRICELESS is engaging with the National Department of Health to determine whether MomConnect is a cost-effective intervention. This intervention was implemented without considerations of costs and relative effectiveness. There may be other interventions targeted at communicating with pregnant women that are more effective in terms of antenatal care or there may be potential areas to strengthen Mom Connect to improve its efficacy.

Despite the importance of health, no country can ever deliver all health services to all people, nor can we adopt all health interventions. Instead, decision-makers have to make choices and determine how to prioritize finite resources. This extramural SAMRC unit will continue to demonstrate how South Africa can get the best return on our health investments while also addressing equity. The COVID-19 pandemic has exposed the necessity to set priorities in a transparent manner that are informed by economics and ethical values. In order to achieve the best outcomes, the process of prioritization needs to be evidence-based, robust and politically legitimate. The evidence will be focused on health prevention and promotion, diagnostics and health care that impacts non-communicable diseases and child health. We will develop and use novel approaches to economic and policy analysis, whilst engaging communities to be empowered in priority setting.

– Prof Karen Hofman

RESEARCH TRANSLATION

PRICELESS SA has made submissions to the National Planning Commission about the role of obesity and its prevention in the health of South Africans and has partnered with advocacy organisations such as HEALA to provide them with evidence for their advocacy. Over and above, the many published articles in peer reviewed journals about its research, PRICELESS SA has had many engagements with print and broadcast media through opinion pieces and interviews, making it easier for public to access the research more easily.

An article titled: "What's in your baby food" published on The Conversation particularly caught the attention of the media and was widely publicised. PRICELESS SA also held a workshop to train journalists about the sugary beverage tax.

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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
2. SAMRC/UP Maternal and Infant Health Care Strategies Research Unit
3. SAMRC/Wits Development Pathways Research Unit
4. SAMRC/UCT Child and Adolescent Lung Health Research Unit

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: Naeemah Abrahams

OVERVIEW

The Gender & Health Research Unit (GHRU) leads research on gender-based violence (GBV), gender inequality and health in South Africa, and works in many countries of the global South. Led by NRF A and B rated researchers, they strive for excellence in the complex areas of GBV epidemiology, understanding the context of GBV, as well as the health and social impact i.e. the costs of inaction to end violence.

GHRU particularly focuses on the intersections with HIV, disability, substance abuse and mental health. Research at GHRU is driven by a determination to improve the lives of women by impacting policy and practice. GHRU leads the What Works To Prevent Violence Against Women and Girls? Global Programme (known as What Works?), which has substantially advanced the global knowledge base on prevention of GBV. GHRU also conducts research to evaluate services and policies to respond to GBV in the health and higher education sectors and criminal justice system.

HEALTH IMPACT

Historically GBV was considered a private misfortune, occurring in a veil of secrecy in the home and not considered a problem with important health, economic and social ramifications. The 1994 Women's Health Conference challenged this when it identified GBV as one of the 17 areas needing action to improve women's health in South Africa. Research from the Unit has enabled the country to understand the scale of the problems of GBV, femicide and child abuse through multiple studies that have employed methods to generate national estimates, as well as an in depth understanding in special populations.

The work on drivers of violence, particularly of men's perpetration of rape has been world leading, and the Unit has pursued a dual strategy of epidemiology combined with in-depth qualitative research which has very substantially advanced our understanding of the context

of violence in the lives of diverse women and men. The work on the health impact of violence has helped the world understand how women's exposure to violence and gender inequality drives their HIV risk. In recent years, the Unit has undertaken ground breaking research to understand how women with disabilities have greatly increased risk of GBV as well as substantially poorer access to a range of services, particularly with unmet needs in the areas of sexual and reproductive health. An area of particular focus has been rape because the prevalence is so high in South Africa. Our research has played a critical role in describing and influencing the contours of the health sector response to rape, as well as developing the standard national curriculum for training health professionals in post-rape care. A particularly important study in recent years has set out to describe the health impact of rape through a large cohort study.

Policy and Practice

Over the last two years, civil society in South Africa has demanded action State-led action to end GBV and femicide. This has provided an opportunity for the GHRU to influence a critical area of Government policy, for the Unit has been leading What Works?, the largest programme of research on GBV prevention across Africa and Asia over the last six years, funded by UK-Aid. This research has been conducted in 13 countries and has evaluated 15 GBV prevention interventions and generated a mass of other research products describing research findings for researcher, practitioner, donor and policymaker audiences. It has focused on capacity developed for prevention practice and research as well as generating knowledge and influencing practice globally and locally.

This work has built on the long-standing programme of research in the Unit on GBV prevention, which included one of the first randomised controlled trials of a GBV prevention intervention in Africa. To date the Unit has developed and tested nearly a dozen interventions for GBV prevention and to bolster the response. One of the recently developed interventions is being tested for the higher education sector in South Africa in response to the spotlight thrown on GBV.

What Works? has culminated in the production of three flagship reports. The first on drivers of violence summarises the state of knowledge in the field and raises key questions for future research, as well as providing a foundation for development of GBV prevention. The second report provides an overview of the field of GBV evaluation research and summarises the global knowledge base on what works to prevent GBV. It shows that there are now 9 different types of intervention that when well designed and implemented have been shown to be effective in preventing GBV in more than one well conducted controlled study. This portfolio can be drawn upon by practitioners with adaptation and implementation according to the local context. The third report is based on research into the intervention portfolio of the Programme and answers the question: what features of the design and implementation of interventions differentiate those that were more or less effective. It points to 10 key aspects of these, which cut across different modalities of intervention. This is a foundational report and will guide stronger prevention programming and spawn the next generation of GBV prevention research deeper into the 21st Century.

Gender based violence which is embedded in gender inequality are key ingredients that feeds under development and although the technological world is advancing at a fast pace, change in correcting economic and gender inequalities is not happening at the same pace. It is therefore critical that we remain vigilant and ensure technological advancement does not further intensify inequalities. The GHRU will therefore continue to raise awareness of the potential role of gender (and economic) inequalities on health and development through our research. We will continue to advance the knowledge on *what works* to prevent gender-based violence and producing robust research that makes a difference in peoples' lives.

A quote from a female research participant in the Rwanda Indashyikirwa couples' intervention sums up the change we are working towards when she said *"I wish all women have the same chance as I had, that they may be set free as I was set free".*

– Prof Naeemah Abrahams

DIGITAL TECHNOLOGIES FOR HEALTH

GHRU's key contribution to the 4IR has been in making data open access as well as open access publishing of our papers. We have compiled the datasets of What Works? and made them available online to enable further analysis of the datasets and the generation of new insights into GBV through further data analysis synthesising learnings across studies. We have used the SAMRC's data repository for this task. This provides the second major data set housed by the Unit, as we have been the global repository for the data of the UN Multi-Country Study on Men and Violence in Asia and the Pacific, which is a cross-sectional dataset collected in nine sites in six countries of Asia and the Pacific region which the Unit contributed to by the Director being the lead technical advisory on the study and the Unit leading the research in Bougainville, Papua New Guinea.

The question of the role of digital technologies in GBV prevention and response is one that requires considerable research to answer. Now we have much greater clarity about what is required for effective GBV prevention interventions, it is very unclear how digital technologies will be of assistance. There has been considerable innovation in the field overall on the development of Apps to link women and girls into care after having experienced GBV. The Sexual Violence Research Initiative (SVRI) which is a global knowledge hub housed within the Unit has funded the development of about 10 such Apps in different countries of the global South, however their evaluation remains at an early stage, and indeed the enthusiasm for developing such Apps far outstrips the knowledge base around their utility particularly for low and middle income countries.

RESEARCH TRANSLATION

Translating the work of our Unit has been central to cover activities over the last 25 years. In the early days our focus was on building the public understanding of the problem of GBV and its drivers within society and so work with the media to disseminate research findings was given particularly high priority. Over the years there has been very substantial local and international interest in work emerging from the Unit, most particular in the areas of rape of learners by schoolteachers, intimate femicide and perpetration of rape by South African men. We have also worked very closely with the South African Government over the last two decades, initially through a Unit-funded initiative the South African Gender-based Violence and Health Initiative (SAGBVHI), which brought together the key players in the country interested in the intersection of GBV and health. Through this the Unit started its work with strengthening national post-rape care services and this led to research advising service provision, developing the national curriculum for post-rape care training and through two studies helping the criminal justice system to understand its performance after rape cases are opened with the police. In recent years we have contributed to drafting the National Strategic Plan for GBV and femicide and have a place on the Interim Steering Committee for GBV and femicide, through which we are encouraging evidence-based prevention and responses.

We have also played a major role on the global stage. Both the SVRI and What Works? have websites with all of their knowledge products. Whilst the What Works? website focuses on the myriad of publications and videos emerging from the six years of work, the SVRI is a global knowledge hub and has links to a vast array of publications on GBV globally. The SVRI also organises a bi-annual conference which is the most important dissemination and networking event for the GBV field in the global South. What Works? has been structured to have research translation as a thread running throughout the programme, with ambitions to impact at every level from global to local in the countries where we have conducted the research. There has been considerable evidence of impact at multiple levels, including in shaping the design of the United Nation's Spotlight programme and the influential RESPECT framework for GBV prevention developed by the WHO and UN Women.

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MATERNAL AND INFANT HEALTH CARE STRATEGIES RESEARCH UNIT

Unit Director: Robert C Pattinson

OVERVIEW

The SAMRC/UP Maternal and Infant Health Care Strategies works to seek saleable, sustained solutions for maternal and infant care at the primary and secondary levels of care. By this we mean we perform research to determine effective interventions in maternal and infant care and then develop strategies to ensure that the health care managers (affordable), providers (implementable) and the pregnant women and their infants (effective) find the interventions are acceptable and sustainable.

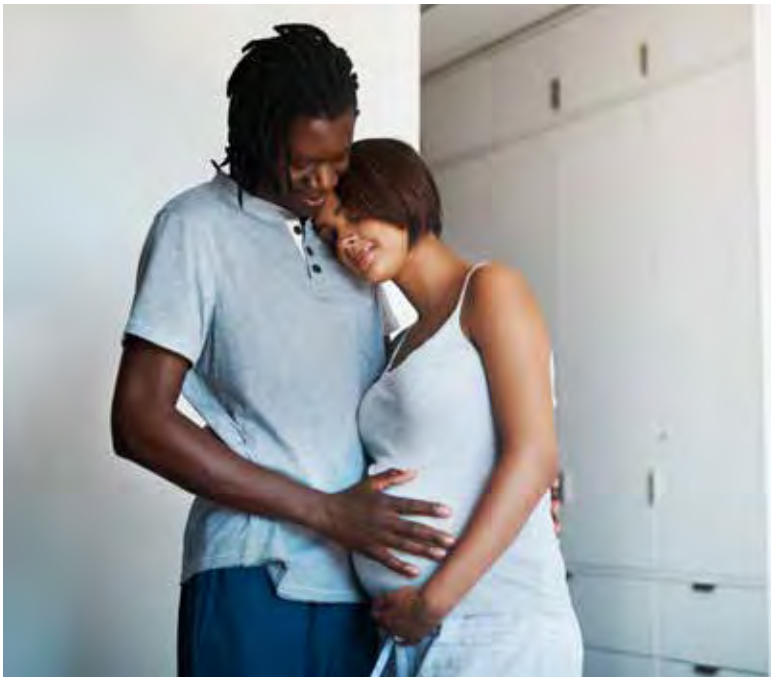
HEALTH IMPACT

The SAMRC/UP Maternal and Infant Health Care Strategies has developed clinical audit programmes for maternal (Maternal Morbidity and Mortality Audit System), perinatal (Perinatal Problem Identification Programme) and child health care (Child Healthcare Problem Identification Programme) and has established these audit programmes as national programmes.

The information obtained from these audits are used by the three ministerial committees in maternal, perinatal and childcare to make recommendations to the Minister of Health such that the maternal, perinatal and child mortality is reduced. These recommendations are used in the National Department of Health's strategic planning. (These programmes have also been expanded to Lesotho, Namibia, Botswana, Kenya, Zimbabwe). The unit has also developed interventions that have been introduced nationally that have been shown to reduce mortality, most notably the Kangaroo Mother Care programme and the Essential steps in Managing Obstetric Emergencies and Emergency Obstetric Simulation Training programmes. Other programmes developed that have been adopted nationally are the Basic Antenatal Care (BANC) and updated BANC Plus, and the intrapartum care guidelines and respectful care (the CLEVER programme).

Policy and Practice

The SAMRC/UP Maternal and Infant Health Care Strategies has impacted on policy by introducing Kangaroo Mother Care and Emergency Obstetric Care programmes which have been scaled up throughout the country and resulted in a significant reduction in neonatal deaths and in maternal deaths, respectively.



The CLEVER intrapartum care programme is in the process of being scaled-up. The research on the introduction of these programmes has impacted on implementation research and the theory of change model was developed to introduce effective interventions. The Kangaroo Mother Care programme has been implemented in a number of African and Asian countries for example Ghana, Nigeria, Malawi, Tanzania, Vietnam, India and Indonesia.

The unit has made a major breakthrough in identifying healthy women at risk of having a stillbirth and preventing the stillbirth. Low- and middle-income countries account for 98% of all stillbirths in the world. The unit has identified placental insufficiency as the major cause of stillbirths in South Africa through its audit programmes.

"Seeking saleable, sustainable solutions for maternal and infant care in primary and secondary levels of care."

– Prof Robert Pattinson

The SAMRC and the CSIR has developed the Umbiflow apparatus that can detect placental insufficiency. The unit, through a SHIP grant, has tested this Umbiflow apparatus by screening pregnant women classified as being low risk in 10 different sites throughout the country (with around 10,000 women tested to date). It found that the prevalence of end stage placental disease in these healthy women was ten times higher than in high income countries. The use of information provided by the Umbiflow apparatus has led to a 55% reduction in stillbirths in these women when compared with women from the same clinics and having been classified as having low-risk pregnancies.

These women would not have been identified as having a problem by conventional means and the stillbirth not prevented. The Umbiflow apparatus is suitable for screening all pregnant women as it is inexpensive and can be used by low level health care providers with two weeks training. This is a novel solution for a world-wide problem. The WHO is currently funding a study run by the unit in five low- and middle-income countries to assess its potential for preventing stillbirths.

DIGITAL TECHNOLOGIES FOR HEALTH

The SAMRC/UP Maternal and Infant Health Care Strategies has developed three clinical audit Apps and an electronic birth register. Once implemented nationally this will provide data on all births and all maternal, perinatal and child deaths. The data from the electronic birth register will be integrated with the DHIS so there is a seamless supply of information. This will supply big data on pregnancies in South African women.

This project will go further and integrate the HIV screening of mothers and babies so that all mothers and infants can be traced and followed-up to ensure each gets appropriate and regular treatment.

RESEARCH TRANSLATION

The SAMRC/UP Maternal and Infant Health Care Strategies three clinical audit programmes have been translated into National Department of Health publications (the Saving series – Saving Mothers, Saving Babies and Saving Children). These publications have appeared annually or biannually since 2001 – the recommendations in each have been included in the National Department of Health strategic plans.

The Unit has written the national antenatal, intrapartum care and emergency obstetric and neonatal care guidelines. The unit has been involved training in the various programmes throughout all districts in the country. The director has accompanied the National Department of Health on visits to various provinces and districts to explain the findings of the reports and engage in developing strategies to solve the problems identified.

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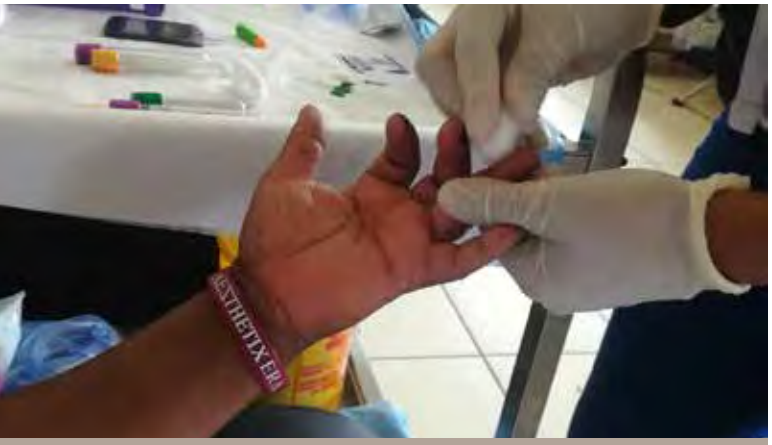
SAMRC/WITS DEVELOPMENTAL PATHWAYS FOR HEALTH RESEARCH UNIT

Unit Director: Shane Norris

OVERVIEW

SAMRC/Wits Developmental Pathways for Health Research Unit (DPHRU) uses a life course approach and longitudinal data to confront the developmental origins of disparities in physical and psychological development. This enables the Unit to better understand how early life trajectories link to adult non-communicable disease (obesity, hypertension and diabetes), and how this science creates an important transformation strategy to ensure healthy ageing for all South Africans and across generations.



Preliminary findings from a study funded by the SAMRC/Newton/GSK have shown that when compared to women, black South African men may be at higher risk of Type 2 Diabetes Mellitus (T2DM) with increasing adiposity

DPHRU staff commemorating World Heart Day 2019 outside the unit's offices at Chris Hani Baragwanath Academic Hospital

HEALTH IMPACT

During the period under review, the DPHRU has contributed towards a transformed SAMRC and South Africa in the following ways:

i. In this period (2019-2020), we published scientific publications and actively disseminated research findings and engaged with the public.

ii. DPHRU has supervised Masters and PhD students to graduation during the last five-year period (2015-2019) – more students are currently enrolled at the Unit.

iii. DPHRU has, and continues to support clinical scientists with their PhDs; three of them are linked to the SAMRC Clinical Scientist PhD Fellowship Programme.

iv. DPHRU has mentored five interns through the DST-NRF Internship Programme.

v. DPHRU, with the UK's MRC Epidemiology Research Unit at the University of Cambridge, established a PhD exchange programme funded by the Newton Fund RCUK-NRF. PhD students from the UK and South Africa engage in an exchange programme to assist in their development and mentoring, and to foster institutional collaboration activities.

vi. 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.

Policy and Practice

DPHRU's senior researchers have made substantial policy inputs at national and international levels on obesity, hypertension, children's movement guidelines, the impact of poverty and inequality on outcomes of early childhood, adolescence, children affected by AIDS, and support for children's caregivers. In addition, they have led or made major contributions to documents for general dissemination such as the Healthy Active Kids South Africa Report Cards and South Africa's 24-hour movement guidelines for birth to five years. DPHRU researchers also worked on a home-based intervention programme to promote nurturing interactions and healthy behaviours in early childhood, and we introduced a new technique into DPHRU to measure gene and protein expression in the adipose tissue.

Particular information regarding these DPHRU senior researchers' participation in seminal policy-making bodies with the dates of their contributions:

i. Lisa Ware (from 2015 to date): Member of a stakeholder group in South Africa (with WHO, Heart and Stroke Foundation, NDoH, Prof. Alta Schutte, and other national and international academic experts) to assess the impact of sodium legislation on population salt intake and blood pressure.
ii. Catherine Draper (2019): Member of the Technical Expert Group on WHO's global standards for healthy eating, physical activity, sedentary behaviour, and sleep in early childhood education and care environments; and member of the WHO Guideline Development Group for guidelines on physical activity, sedentary behaviour and sleep in children under 5 years of age.

The DPHRU has undertaken numerous research programmes and projects that have influenced further research or innovation during the period under review, including the following:

i. Birth to Twenty Plus Birth Cohort Study
ii. Gestational Diabetes Mellitus (GDM) screening and prevalence study (South Africa)
iii. Soweto First 1000 Days Cohort Study
iv. Analysis of a case history collection of over 2000 GDM women treated since 2007 at Chris Hani Baragwanath Academic Hospital in Soweto
v. Adaption of the Amagugu intervention to promote physical activity, gross motor skills and cognitive development in preschool children from low-income settings
vi. Executive function in South African preschool children from low-income settings
vii. Study of Women Entering and in Endocrine Transition (SWEET)

DIGITAL TECHNOLOGIES FOR HEALTH

The Unit has advanced the area of measurement of infant movement through the design, development and testing of an infant wearable wrist band which has now been made commercially available.

For the first time globally, analytical methodology has been developed to describe and interpret 24-hour movement during infancy using the wrist band, to investigate relationships between mother and infant physical activity using synchronous 24-hour monitoring, and to examine associations with motor development and growth (stature and adiposity).

A testing of the feasibility of the "babycam" technology developed by colleagues at Bristol University as a complementary measure to the baby wrist band, as an objective measure of the caregiver-infant interaction in a home setting, had also begun.

RESEARCH TRANSLATION

Researchers' proactive engagement with journalists and publication of articles on The Conversation website resulted in extensive media coverage of many of our research outputs in 2019. There were 81 media mentions in 2019. A peak in coverage took place in February due to an article in The Conversation written by Catherine Draper and global colleagues on international findings on why children's screen time should be limited.

Coverage was also high in June when there was extensive re-publication of an article written by Alessandra Prioreschi for The Conversation. This article summarized the findings of a recently published paper on the reasons given by young women in Soweto about why healthy living is difficult for them. The research findings were also discussed in two radio interviews.

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The non-communicable disease (NCD) burden is a substantial health concern for South Africa. Consequently, for the next five years, we at DPHRU will focus on generating and communicating scientific evidence on innovative studies and interventions to ensure that a person's NCD risk is lessened substantially through preventative measures across the lifecourse. In collaboration with local and global partners, we will be continuing a number of cohort studies and evaluating interventions during the preconception, pregnancy, childhood, adolescence, and adulthood phases. We believe such scientific endeavours have the potential to shift people's life trajectories and are being urgently sought for policies, health programmes and clinical practice in South Africa and beyond.

– Prof Shane Norris

SAMRC/UCT UNIT ON CHILD AND ADOLESCENT HEALTH RESEARCH UNIT

Unit Director: Heather Zar

OVERVIEW

The work of the SAMRC Unit on Child and Adolescent Health focuses on some of the key health issues affecting children and adolescents in South Africa, Africa, and globally. These include studies of the drivers and epidemiology of early childhood illness and their impact on short- and long-term health.

Key research areas were:

i. a birth cohort study, the Drakenstein Child Health Study (DCHS) with a focus on early life infectious exposures and long-term impact including lung health, growth, neurocognitive development

ii. studies of childhood TB to strengthen diagnosis, management and evaluate long term outcomes

iii. studies of chronic disease progression in HIV-infected adolescents on cART and

iv. studies of childhood pneumonia to investigate aetiology, risk factors, outcomes and long-term impact. Research encompassed a broad range of methodologies from epidemiology to clinical science to laboratory-based methods. Capacity development formed a core part of the activities with high throughput of postgraduate students, training, development of new clinical sites and technology transfer.

HEALTH IMPACT

The Unit is generating new knowledge and developing improved strategies to diagnose, prevent, and treat priority childhood illnesses. The work has been underscored by building capacity in clinical translational science through strong collaborations with partners in basic science as well as in public health. Research sites are located at the Red Cross Children's Hospital, in community peri-urban settings outside Cape Town and in the Eastern Cape. The Unit has several collaborations with local, African and international partners building local capacity both of resources and expertise. Accompanying these has been high throughput of masters, doctoral and post-doctoral students from South Africa and Africa. During the reporting period the Unit has supported the work of 18 Masters and 24 PhD students and 11 post-doctoral fellows.

Examples of innovative research in the area of pneumonia or TB include: longitudinal analyses of microbiome interactions to understand pneumonia aetiology; developing lung function for respiratory disease in African children, and identifying a novel lung function measurement as a marker of risk for pneumonia or wheezing; use of novel radiological techniques (ultrasound and MRI) for diagnosis of TB or pneumonia; innovative testing for TB including stool, urine, oral swab, and breath

testing; long term measurement of impairment following TB with lung function.

Long term health innovative work includes brain imaging in children and adolescents to understand the impact of exposures (including HIV) and association with neurocognition; use of a Neurocognitive Assessment App using an easy-to-use tablet-based interface to assess neurocognition; breast milk microbiome analyses and association with growth; and the association of maternal psychosocial distress or maternal and child health including birth outcomes, pneumonia, and neurocognition.

Innovative interventional studies include the first study in Africa of the safety of faecal microbiota transplant in children with malnutrition (Transfer of health gut flora for restoration of intestinal microbiota via enema (THRIVE)); a book sharing intervention where parents (literate or illiterate) are provided with books and receive small-group training on the technique of sharing picture books with their young children to promote neurocognitive and social development; participating in multicentre trials of new RSV preventive interventions including both child and maternal vaccination and a novel long acting monoclonal antibody.

Policy and Practice

Additional to its contribution of publications in peer-reviewed and high impact journals; national and international conferences presentations; the Unit developed a one-page policy document highlighting key findings in maternal and child health, pneumonia, TB, neurodevelopment, growth/nutrition, and chronic respiratory disease highlighting the impact of early life exposures on long term health, noting that interventions during pre-conception and pregnancy are key.

Key findings from studies of tuberculosis include data on the use of Xpert-Ultra on different samples (induced sputum, nasopharyngeal aspirates, stool) and a novel strategy for testing in children that involves combinations of samples to maximise sensitivity. Using this approach, testing on an induced sputum specimen and on 2 NPAS detected 88% of culture confirmed cases, amongst the highest sensitivity reported for a paediatric diagnostic test. Results from testing of oral swabs with an in-house PCR test, found this to have substantially lower sensitivity than Ultra on induced sputum; however oral swab testing may be useful to supplement induced sputum testing. These studies have led to further research including a study of Ultra on oral swabs and on sputum, and investigation of other new biomarkers.

Recently the DCHS summarised key findings and policy recommendations from the study as follows:

i. Early life exposures impact long term health; interventions during pre-conception and pregnancy are key.
ii. Urgent and effective strategies are needed to decrease tobacco smoke exposure in young children and improve smoking cessation programmes for childbearing women.
iii. Maternal mental health is a neglected but critical aspect of maternal and child health and wellbeing.
iv. Isoniazid preventive therapy for children with TB must be strengthened. Pneumonia and TB programmes must be integrated.
v. Screening for developmental delay should be done with strengthened early interventions; screening for language delay and early intervention is especially important in HU children.
vi. Maternal education on appropriate foods is needed; affordable nutritious foods must be available.
vii. Pneumonia has a long-term impact on lung health; efforts to prevent childhood pneumonia must be strengthened.
viii. Multisectoral interventions are needed to promote health. These require integration of programmes in nutrition, education, poverty alleviation, housing, sanitation, environment and maternal and child health.
ix. Risk factors for compromised child lung health (measured by lung function testing) include household tobacco smoke, pneumonia, maternal psychosocial risk factors (IPV, depression, PTSD) and HU infants where maternal HIV disease was poorly controlled in pregnancy.

The THRIVE study successfully conducted 3 microbiota faecal transplants in children who have resistant malnutrition. The study continues to screen and recruit eligible participants and follow up those who have been enrolled to determine successful outcomes.

DIGITAL TECHNOLOGIES FOR HEALTH

The Unit is committed to data sharing to enable researchers to apply cutting edge analysis to the study of factors which determine disease susceptibility. Collaborations in well-resourced high-income country institutions (UK, USA, Europe, Australia, Canada) has enabled application of cutting-edge techniques to samples as well as technology

transfer. We have contributed to multiple consortiums such as H3 Africa where whole genome shotgun metagenomic sequencing and 16S sequencing was conducted on study samples.

Furthermore, we have contributed to global data bases that enable cross cohort and cross population comparisons. The comprehensive metadata collected across studies in the Unit is integrated into a database that includes clinical, laboratory, radiological and other data, and links these to a rich biorepository of samples, providing a unique resource. Advanced technological applications and bioinformatics enable integration and analysis of data and cross cohort comparisons.

Digital data collection is done in all studies across the Unit. Communication with participants and families is also digital, enabling quick and efficient intervention. More specifically, our TB research has supported computer learning activities related to the diagnosis of TB using an automated assessment of chest x-ray images. These will inform artificial intelligence computer learning programmes to diagnose pulmonary tuberculosis using x-ray images. This technology will allow for images to be analysed by a computer programme that takes into consideration reader variability and image sensitivity. Similarly, MRI studies of children with pneumonia and TB are contributing to a better diagnostic standard of childhood TB.

We strive to enhance the health of children and adolescents by generating new knowledge in diagnosis, management and prevention of illness and by increasing understanding of the risk factors, host responses and long term outcomes of disease. To do this, we've established large cohort studies followed longitudinally, using a broad range of methodologies bridging population science, clinical science and laboratory-based methods. A flagship birth cohort study, the Drakenstein Child Health Study focuses on the early life determinants of child health, mechanisms of disease development and long term outcomes including lung health, neurocognitive development and growth. A strong focus is on building research capacity, and development of clinician scientists in South Africa and Africa to undertake translational research that will improve child and adolescent health.

– Prof Heather Zar

The DCHS has investigated improved digital technologies, such as using chest ultrasound as a first line alternative technology to diagnose pneumonia in children. CTAAC has contributed towards improved technologies in a number of ways including the use of an ultrasound to calculate bone density, using chest and abdominal ultrasound to detect TB and other abnormalities, and using a novel tablet-based Neurocognitive App to assess neurocognition all in this cohort of South African perinatally HIV-infected adolescents.

RESEARCH TRANSLATION

Research from the Unit is published in high-impact peer-reviewed journals and presented at local and international conferences. Data is also used to inform global health policies and practices. Locally, results from our studies are shared with primary healthcare workers, ensuring our participants have access to needed care. A policy document from the DCHS highlighting key findings in maternal and child health, pneumonia, TB, neurodevelopment, growth/nutrition, and chronic respiratory disease and the impact of early life exposures was produced and shared with the South African Department of Health. Study results are shared nationally and globally with the public and other stakeholders at key conferences and national and international health awareness days (e.g. World Pneumonia and World TB Day) through production of materials and dissemination through local and global networks.

Research from the TB studies has been used to inform the transition to the use of more the sensitive assay (Xpert Ultra) for diagnosis of TB in paediatric patients. This assay is now used in South Africa at the National Health Laboratory as the standard replacing its predecessor the GeneXpert assay. Other countries have now begun to replace this assay in their laboratories as well following the lead from South Africa. The DCHS actively works to design messaging that is relevant to stakeholders and the general public by distributing newsletters and informational materials and with ongoing community engagement. A library has been established at one of the main schools that serves the children of the DCHS to strengthen literacy and neurocognitive development.

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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 Prevention Research Unit
2. Centre for Tuberculosis Research Unit
3. Office of Malaria Research
4. SAMRC/CAPRISA/UKZN HIV-TB Pathogenesis and Treatment Research Unit
5. SAMRC/NHLS/UCT Molecular Mycobacteriology Research Unit
6. SAMRC/NHLS/Wits Respiratory and Meningeal Pathogens Research Unit
7. AIDS and TB Research Unit (TB REPORT | TB Platform | Social Impact Bond)
8. SAMRC/UCT Centre for the Study of Antimicrobial Resistance

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

HIV PREVENTION RESEARCH UNIT

Unit Director: Ameena Goga

OVERVIEW

The SAMRC prioritises four colliding national health epidemics for research: maternal, new-born and child health; HIV/AIDS and tuberculosis (TB); non-communicable diseases; and violence and injury. The HIV Prevention Research unit (HPRU) aims to conduct clinical, basic science, behavioural and epidemiological research amongst adults, youth, adolescents and children to advance HIV-related prevention and treatment science in KwaZulu-Natal, South Africa, and globally.

The Unit, located in KwaZulu-Natal, the epicentre of the global HIV/TB epidemic, is uniquely placed to conduct such research. Over the past year, HPRU has implemented four global HIV prevention trials (viz., two vaccines, one monoclonal antibody and one long-acting antiretroviral), two socio-behavioural studies to understand participants enrolling in microbicide and HIV prevention trials, respectively and mapping the hot-spots for HIV acquisition. The HPRU works in partnership with the South African Department of Health to provide evidence-based research that informs policy and programmes for local and international impact on the HIV epidemic.

HEALTH IMPACT

(i) The CTX study showed that no co-trimoxazole was not inferior to daily co-trimoxazole among breastfed HIV-exposed, HIV-uninfected infants whose mothers are accessing a prevention of mother-to-child transmission programme in an area unaffected by malaria. Results have been presented to the National Department of Health and World Health Organization and provide evidence that CTX should be removed as an intervention for HIV negative infants born to HIV positive mothers, in non-malaria countries with well-established PMTCT programmes.

(ii) The HVTN 702 study represented a leap forward in vaccine design, since the study built on correlates of protection identified in earlier safety studies. The vaccine utilised a Clade C insert, specific for the dominant circulation clade of virus in circulation in our local setting. Recently, in February 2020, a routine Data Safety and Monitoring Board review found that the study met criteria for non-efficacy, resulting in the stop of further vaccinations for all enrolled participants. Whilst this non-efficacy outcome is disappointing the study provided insight into the fact that several factors including background population risk, virus strain, co-morbidities including sexually transmitted infections need to be considered during HIV vaccine development in Africa.

DIGITIAL TECHNOLOGIES FOR HEALTH

The HPRU implemented a novice system, embracing technology developments, to transition from cash to a cashless system for reimbursements to study participants. This entailed the use of a web-based system to transfer funds by authorized users for reimbursements from the organization's bank account to a card which is then issued to the participant.

The objective of transitioning to use cashless technology was to mitigate the risks associated with cash to both staff and research participants, to reduce paperwork and to improve the speed of providing reimbursements. The change management process commenced with a consultative process with both the participants and staff. Both groups were allowed the opportunity to share their views, suggestions and any concerns as users and providers of cashless reimbursement. Training and the infrastructure provided staff with the tools to implement the system. The system was piloted at one HPRU clinical trial site, and then scaled up to all other sites.

Our research sites see participants daily. We use electronic data capture (EDC) for data entry on two study-specific programmes namely Medidata Rave™ (web-based portal) and iDataFax. The clinical research site (CRS) is fully Wi-Fi-enabled, allowing EDC to take place using laptops or desktop computers. In the EDC programmes, queries to data entries that are available online, are addressed timeously which has resulted in excellent data metrics. More recently, we have identified the need to track participants as they move through our research site so that we offer a more efficient service and can identify and remove bottleneck to participant flow. We are currently planning to field test a digital technology that could help with this tracking. During this reporting period, participants across our CRSs have had access to free Wi-Fi.

Furthermore, our research aims to improve the diagnosis and timely management of diseases. We have studied point-of-care HIV testing for early infant diagnosis at a primary health care clinic. Results demonstrate that point-of-care HIV testing for early infant diagnosis is accurate, feasible and acceptable to mothers and health care staff, with benefits of early antiretroviral therapy for all positive infants at birth facilities. We recommend that point of care technologies be scaled up as best practice for early infant HIV diagnosis. Future work will include studying point of care technologies for chronic care.

RESEARCH TRANSLATION

The Unit conducts all research in partnership with the stakeholders, research site community and participants. The Unit has a core Team of community liaison officers (CLOs) and community recruitment / retention officers (CROs) who work closely with community working groups (CWGs) and community advisory boards (CABs). The CLOs / CROs have developed a longstanding participant and stakeholder engagement programme with the stakeholders and participating communities. This programme includes communication, education, training and skills development at multiple levels. Two annual community-based road shows were completed to assist in meeting accrual targets across all clinical research sites (CRSs). Engagement with the research site community and stakeholders on health issues that may be unrelated to specific trials formed part of the education and training programme to promote health and wellbeing in the communities in six areas in Durban. The education and training programmes have contributed to an informed community around research ethics and good participatory practices. Additionally, the research teams have developed skills and capacity among the members of the CWG at the 6 clinical research sites with focused training and information sessions. This was strengthened by quarterly meetings with the CWG, consisting of key stakeholders that are representative of the community. The CWG is reconstituted annually to ensure diversity, relevance, and representation for the interests of a dynamic community. As part of their own skills development, they participate in various regional and national meetings.

Meetings are held with CWG and other key stakeholders quarterly, whilst key research outcomes (such as final study results) are disseminated according to a stakeholder directory on an ad hoc basis. The community programme is documented in a cross-network Community Engagement Work Plan (CEWP), which details expected outputs for key indicators, such as education, recruitment, retention and community engagement. The HPRU Clinical Trials Unit holds a Memorandum of Agreement with the provincial Department of Health and holds regular meetings at district hospitals and clinics around research progress. These relationships are constantly renewed and strengthened

Over the next five years the HIV Prevention Research Unit will invest in developing and implementing high quality science using rigorous methodologies and innovative ideas to advance the health of South Africans and the global community. In particular we will facilitate career advancement and personal growth and development of all staff members, and strengthen linkages with community structures. We will use our science, technologies and innovations to be part of solutions to reduce morbidity and mortality relating to HIV infection, COVID-19 and TB.

– Prof Ameena Goga

Aseptic Room within the Pharmacy for Injectible Study Product Preparation

Tongaat Clinical Research Site

Botha's Hill Clinical Research Site

to support access to care for trial participants during and after study participation. During 2019-20, the CLOs played a role in the Provincial AIDS Committee (PAC), District AIDS Committee (DAC) and several roles in the site based local council groups.

Regarding partners, the HPRU maintains strong relationships with the USA National Institute of Health, the HIV Vaccine Trials Network, and HIV Prevention Trials Network. During 2019-20 HPRU, strengthened collaborations with CAPRISA, a key research partner in KwaZulu-Natal, to intensify efforts to reduce HIV incidence, and manage the HIV epidemic. In November 2019, we submitted a joint application for the next CTU grant cycle as the KZN CTU to strengthen our research and the potential impact we have within communities.

Furthermore, to translate key research findings into policy, the Unit presented the preliminary CTX study results at the HIV-exposed uninfected child National Expert Meeting (20 Feb 2019) and the national PAEDS/PMTCT technical working group meeting (07 March 2019). Final study results were presented at the KZN Department of Health research day (14th of September 2019), and the KZN HAST group (20 January 2020). CTX study results were also sent to the World Health Organization, and implications for global policy are currently under consideration.

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Isipingo Clinical Research Site

Laboratory in a Clinical Research Site

CENTRE FOR TUBERCULOSIS RESEARCH UNIT

Unit Director: Rob Warren

OVERVIEW

The Centre for Tuberculosis Research (CTR) focuses on the Tuberculosis (TB) research in humans and animals to provide knowledge and build capacity that informs the continuum from basic biology, to diagnosis, to treatment.

The CTR is strongly aligned with the four SAMRC strategic goals: Goal 1: positioning the SAMRC as a world leader in TB research through state-of-the-art fundamental and clinical research to generate knowledge to achieve the End TB goals. Goal 2: developing and evaluating faster and more accurate diagnostic tools to shorten time to diagnosis and to optimize treatment regimens which lead to improved patient outcomes. Goal 3: embracing innovation and new technologies and collaborates widely to move knowledge forward to inform policy with the aim of improving health care. Goal 4 : training the next generation of research leaders, thereby stimulating economic development through future discoveries, product development, and entrepreneurial ventures. The CTR engages with communities, to educate and inspire future generations to follow careers in science.

HEALTH IMPACT

The SAMRC CTR is committed to research focusing on tuberculosis, with priority research questions determined by SDG 3.3, and has embraced new technologies, developed innovative tools and adapted research strategies to reach these targets as well as transform the South African medical research landscape. The SAMRC CTR strongly recognizes the growth of the individual in knowledge, skills acquisition and experience, in line with the national imperatives for the development, mentoring and nurturing of young scientists from across the nation and from diverse backgrounds.

The SAMRC CTR has contributed knowledge to genetic diagnostic testing of Mycobacterium tuberculosis in clinical isolates in a global consortium to influence WHO policy. The application of Next-Generation Sequencing has influenced the replacement of classic drug susceptibility testing methods with advanced high throughput methods [real-time whole genome sequencing (WGS) for patient management]. The CTR has contributed to setting the standard for target product profiles (TPPs) for biomarkers, sputum diagnostics, and rapid TB drug susceptibility testing.

Staff and students engaging learners from Cedar High School of the Arts in Mitchell's Plain to raise awareness around TB during the #MBHGHipHop TB initiative

The CTR's evaluation of the Xpert MTB/RIF Ultra diagnostic algorithm has prompted revisions to the Provincial algorithm. An alternative diagnostic approach is now used in people who have recent or previous TB and are symptomatic. These individuals, who are at high risk of recurrent TB and are an epidemiologically important patient subgroup, also have old TB DNA in their respiratory secretions which gives unacceptably high rates of false positive PCR results. Therefore, other diagnostic methods (culture, smear, clinical decision making) are now mandated for use in this subgroup. Additionally, the CTR has started implementing NGS technologies as first tier diagnostic tests for South African patients with Mendelian Susceptibility to Mycobacterial Disease (MSMD) and other rare disorders which has changed the management and treatment for many newly diagnosed patients, in line with global advances in the field.

Furthermore, new blood-based diagnostic tests for screening rhinoceros for TB developed by the CTR has been crucial in creating a management plan, approved by the Department of Agriculture, to permit movement of these species from quarantined areas. The CTR is currently working with veterinarians and managers of private reserves and national parks to apply new techniques for identifying TB in cheetahs, leopards, and wild dogs, to allow translocations to minimize risks of transmission of TB.

Students engaging learners from Cedar High School of the Arts around TB diagnostics during the #MBHGHipHop TB initiative

Influenced further research

The CTR's pioneering linkage studies in the SA population have contributed to the concept of the "resister" phenotype, which may enable the discovery of new preventative TB treatment and now is the subject of large collaborative grants by BMGF and NIH. We have recently established criteria to identify the resister phenotype in HIV positive individuals who, despite increased infection susceptibility and intense M.tb exposure, remain uninfected.

The CTR's discoveries regarding the persistence of Mycobacterium tuberculosis during treatment have sparked great progress into ways to measure tuberculosis treatment response. The successful optimization of CRISPRi technology through the generation of CRISPRi hypomorphs of some essential genes in mycobacteria are being investigated in chemical-genetic primary screening assays to identify new drug leads and elucidate mechanism of action of hit compounds. A search for new drug leads is currently underway in collaboration with University of Limpopo and Walter Sisulu University.

The identification of differentially expressed genes against mycobacteria, in infected human blood monocyte derived macrophages have sparked further investigation of these unique targets for their functional properties and to access their role in the intracellular killing of pathogenic mycobacteria.

The CTR is investigating the potential clinical relevance of pathways that serve as possible targets for host-directed-immunotherapy (HDT) in TB. The outcome of this work will provide the basis for novel intervention strategies by providing new information relevant for the design of TB prevention or treatment regimens, e.g. targeting of MDSCs as therapeutic potential. In addition, platforms developed within the CTR of novel deuterated antiretroviral compounds for viral diseases have led to negotiations with international collaborators for their use against the Covid-19 coronavirus.

The CTR's programme investigating TB in South Africa's wildlife has stimulated interest in One Health collaborations, especially with international and regional scientists. These collaborations have created the opportunity to bring new techniques/capacity to South Africa and implement additional research paths. Data generated from the CTR has resulted in numerous local and international collaborations and multiple international research grants.

Engaging learners from Cedar High School of the Arts around TB Signs and Symptoms during the #MBHGHipHop TB initiative

DIGITAL TECHNOLOGIES FOR HEALTH

The CTR continues to generate big data sets with the view to understand and improve health through the field of omics and pathogen biology. The CTR will continue to contribute omics and pathogen biology data to the global dataset on open source platforms. These datasets will include host and pathogen genomes, transcriptomes, microbiomes, proteomes, metabolomes, and phenotypic characteristics. These datasets are being analysed through artificial intelligence algorithms to improve TB treatment regimens as well as to develop acoustic technologies for TB diagnosis and patient triage. Importantly, a major challenge within the context of the 4IR is bridging the analysis of multiple types of omics data. For example, for the Centre's microbiome research programme, data are simultaneously collected on the microbiome, transcriptome, and metabolome. Co-analysing these large forms of data – often across multiple compartments within a patient as well as serially over time – is computationally extremely challenging (many of the analytical approaches are yet to be established). To this end, the Centre is collaborating with international method development experts, under whom students within the Centre receive mentorship and training.

The CTR's research involving big data and precision medicine have already resulted in stem cell transplants for individual cases. Our current research could in future lead to genetic therapies via genetic engineering (e.g. CRISPR) to remove TB susceptibility variants or to cure MSMD without the need for a stem cell transplant, as was recently done for hereditary blindness. The collection, storage and analysis of these datasets (including metadata), which are already expanding in conjunction with the SAMRC Genomics Centre, not only requires proper data management, cloud computing and storage, but also requires physical interaction by our collaborator clinicians with the affected individuals.

Current research projects include the development of new TB tests and the first of such prototype tests is undergoing field evaluation in several countries. For example, these include the evaluation of the first-to-market test (Xpert Predict3) for incipient TB (this is newly-characterised form of TB in people who are asymptomatic and healthy but have a very high probability of developing active TB in the short term), done in partnership with recruitment sites in Mozambique and Uganda. Another trial of a novel lateral flow assay test called SeroSelectTB will shortly start for the diagnosis of active TB. This has particular promise in HIV-positive individuals and may prove to be the first true point-of-care test for active TB diagnosis that is deployable on the frontline in primary care.

As part of our investigations, we developed a 3D-bioprinted TB lung granuloma model through levitation, building this structure using primary immune cells from the lung. This could replace the need for many in vivo models currently used to study pulmonary TB and serve as novel platform for TB drug testing.

Next Generation Sequencing of Mycobacterium bovis isolates from wildlife cases, coupled with GIS and social network models have been used to investigate the epidemiology of bovine tuberculosis in complex ecosystems. This innovative application of technology

will provide new insights into the transmission and risks of infection across multiple hosts. The focus on multiple animal species including both livestock and wildlife will provide foundational data that can be used to evaluate changes related to ecosystem variations including the impact of climate, human encroachment, interfaces between species, and changing land use. Models that evaluate presence, prevalence, and movement of zoonotic diseases, such as TB, are improved when there are existing data to support assumptions. These models may be able to predict changes in disease that can impact human health globally, livelihoods, food security, and biodiversity in South Africa.

RESEARCH TRANSLATION

The CTR is committed to the translation of research findings both to the communities we serve, in the form of science engagement and to policy makers through feedback sessions. The CTR is also dedicated to public engagement and science communication initiatives with the vision to promote health and enthusiasm around STEM careers. In addition to our scientific publications and presentation at local and international meetings, we provide feedback to all levels of health department and healthcare structures and communicate to our communities through our community advisory board and open events. Members of the CTR have interacted with the media by writing scientific communication articles, participating in radio interviews and events such as FameLab on a national level.

The results of the application of newly developed bovine TB diagnostic tests are being shared in meetings with stakeholders such as state and provincial animal health officials, private reserve managers and wildlife veterinarians and this has resulted in expansion of our field testing to optimize applications.

It is well recognised that innovation in the development of new technologies will be essential to meet the 2030 goals of reducing the burden of Tuberculosis by 80% and mortality by 90%. The CTR seeks to improve the health of South Africans by advancing knowledge in tuberculosis infetion, diagnostics, diseases and therapeutics. With the Fourth Industrial Revolution looming, we must equip our youth with the tools and knowledge to bring about critical and creative thinking and problem-solving skills, while simultaneously inspiring and empowering the next generation of students and scientists to pursue careers in STEMI (science, technology, engineering, maths and innovation). Partnerships connecting community, governments, industry and academia are essential to meet these goals; therefore the CTR prioritises collaboration to form new relationships to address key health challenges in the region.

– Prof Rob Warren

The Primary Immunodeficiency Genetics Network (PIDDGEN) is a multidisciplinary team of researchers and clinicians that provide genetic diagnoses to South African patients with Primary Immunodeficiencies (PID) who are at the end of their diagnostic odysseys. Members of PIDDGEN regularly interact with our stakeholders, who are patients, their families and treating physicians. Our genetic results are fed back to treating physicians which has a direct impact on the treatment and management of their patients. This ongoing precision medicine programme has provided genetic diagnoses for dozens of PID patients since 2013, even resulting in stem cell transplants.

Scientists within the CTR are regularly invited to serve on expert panels, with researchers recently invited to an expert workshop on MDSC and immunosuppressive cells, organized and funded by the National Institute of Allergy and Infectious Diseases (NIAID), where they presented a plenary talk on the summary of their work, which led to: (1) an expert review on MDSC, jointly coordinated by Dr. Du Plessis (CTR) and Prof. Dorhoi (Germany), submitted and currently under review by a peer-reviewed journal; and (2) an announcement by the NIH to fund (R01/R21) research on the role of MDSC in TB and HIV. Other members of the SAMRC CTR have given invited lectures on challenges pertaining to the diagnosis of TB in the context of previous TB (as part of symposia; the outcomes of which are currently being drafted into position statements).

Scientists at the SAMRC CTR are committed to capacity development and training in Africa and have developed partnerships with ministries of health and research collaborations in Namibia, Zambia, Mozambique, Ethiopia, Botswana, Tunisia, Lesotho, and DRC.

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OFFICE OF MALARIA RESEARCH

Unit Director: Rajendra Maharaj

OVERVIEW

The Office of Malaria Research (OMR) aims to eliminate malaria as a public health concern in South Africa through research and innovation. The Office 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. The OMR supports the National Department of Health malaria elimination agenda that reinforces the interventions in place, by generating new knowledge and techniques that impact upon malaria transmission.

Since the Office is staffed by people who have experience within the Department of Health and in a research environment, the OMR is strategically positioned to influence the malaria research agenda of the country and the southern African region. Research efforts are aligned to the National Elimination Plan of the National Department of Health. The Director of OMR sits on the Boards of the Elimination 8 initiative as well as the Board of the Lubombo Spatial Development Initiative 2, which oversees regional malaria research and control efforts.

As a result of the development of resistance to insecticides in mosquitoes, new chemicals are required. OMR has partnered with Syngenta to evaluate the effectiveness of new chemicals in the malaria areas of KwaZulu-Natal.

HEALTH IMPACT

Malaria control is at cross-roads where all vector control interventions are being rendered ineffective due to the development of insecticide resistance. Resistance has been

reported to all classes of insecticides that are currently recommended for use by the World Health Organization. Through collaborations with major insecticide companies, OMR has evaluated new chemical formulations that could be used in malaria control interventions. As such, these new insecticides are in the process of being registered with the Registrar of Insecticides for use in indoor residual spray programmes.

The Lubombo Spatial Development Initiative, a tri-country initiative, was the brainchild of the Malaria Research Unit and has been revived as the MoSaSwa initiative by the OMR and other stakeholders. The Director of OMR sits on the Board of LSDI2 which is funding the MoSaSwa project and has oversight over the vector control interventions that have been successful in bringing South Africa, Eswatini and Mozambique to the brink of elimination. The model developed by the SAMRC has been adopted in various countries across the continent.

Policy and Practice

i) SumiShield Project: Insecticide evaluations have been conducted for new active ingredients and new combination of insecticides. Insecticides that were trialled in South Africa and found to be effective alternatives to DDT have been rolled out in Mozambique. These insecticides were found to be effective in controlling malaria and have contributed to the move to foci spraying in southern Mozambique.

(ii) LSDI2 Project: Breeding site mapping: A foci clearing programme has been adopted by the National Department of Health to further the elimination agenda. This requires a response to a cluster of cases which includes the mapping and treating of mosquito breeding sites, usually small pools of water. Current methods of mapping breeding sites require manual mapping of the breeding sites. This has been ineffective in finding breeding sites off the beaten track. Identification of breeding sites using drones has, in preliminary studies, been found to be more efficient and it can identify all breeding sites around a hut, thus enabling vector control staff to treat all breeding sites that could produce mosquitoes that could cause further transmission. This study is in its infancy and larger projects have been planned.

DIGITAL TECHNOLOGIES FOR HEALTH

As part of our insecticide evaluation studies, we are trialling the use of temperature loggers to investigate the impact that the indoor temperature has on the insecticide efficacy. The data can then be used to determine if the manufacturer should be reformulating their product to accommodate the variance in temperatures across their target market. We are working closely with the Data Management Division of the SAMRC and a collaborator to develop a tool that will also link with the temperature loggers in the insectary to determine the optimum conditions for the efficacy of the insecticide and the breeding behaviour Anopheles arabiensis under simulated field conditions. If successful, the tool can be applied to several areas of malaria control to further the elimination agenda.

Efficient surveillance is critical for the control of malaria vectors. We are developing a surveillance tool utilising drones that will geotag larval breeding sites around the residence of malaria cases. The information will be fed into a central database and all malaria surveillance officers will have access to it for inclusion in their foci clearing programme as well as for programme planning. This will allow anyone from the team to track patients and conduct entomology activities.

Currently drones are being evaluated for their contribution to improving breeding site identification during policy implementation in the form of the foci clearing programme. The preliminary results suggest that the use of drones can enhance larval vector control measures, but it also has the potential to be used in the application of insecticides to these breeding sites to help prevent drastic increases in adult mosquito populations. Drones are also currently being used to study the architecture of homes in the malaria areas to identify ways in which the structures can be made mosquito proof as well as examining roofs to determine whether they present potential breeding sites, most especially in houses with slabbed or flat roofs.

The OMR has been involved in a multi-partner project to determine whether weather data can be used in conjunction with historical case data to forecast the occurrence potential malaria epidemics up to six months in advance. This has proven to be quite effective in a small study in Limpopo province, but there are initiatives that aim to extend this to the other malaria affected provinces and to the neighbouring countries. The OMR has held discussions with the Elimination 8 initiative with a view to expanding this to the eight southernmost African countries who are targeting malaria elimination by 2030.

RESEARCH TRANSLATION

The OMR regularly publishes articles in open access journals such as the Malaria Journal. Over the previous financial year, the Office has published four articles in speciality journals relevant to the field of research. Regarding the evaluation of insecticides, the results are presented in the form of technical reports to the person commissioning the research, before the results are disseminated to the scientific community. Over the past year, the results have been presented at the Multi-lateral Initiative on Malaria conference (Senegal), the Southern African Malaria Research Conference (South Africa) and the American Society of Tropical Medicine and Hygiene (United States of America). Results from insecticide trials are conveyed to the public via the provincial malaria control programmes in the relevant areas where community discussions are held.

Communities that have been involved in the insecticide evaluation studies are given verbal feedback by the malaria surveillance agents during the study and after the study has been completed.

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SAMRC/CAPRISA/UKZN HIV-TB PATHOGENESIS AND TREATMENT RESEARCH UNIT

Unit Director: Salim S. Abdool Karim

OVERVIEW

The CAPRISA-SAMRC HIV-TB Pathogenesis and Treatment Research Unit undertakes impactful research to reduce morbidity and mortality from HIV-TB co-infection. The unit addresses the primary cause of death among people living with HIV, in a setting where HIV and TB infection are the main contributors to South Africa's mortality burden. The unit's research agenda includes clinical medicine, epidemiology, biostatistics, immunology, microbiology and public health with five focus areas:

(i) Implementation science to enhance translation of clinical trial evidence into effective integrated HIV-TB services to improve survival of HIV-TB co-infected patients

(ii) Improving survival of HIV-TB co-infected patients through optimized treatment

(iii) Generating new knowledge on immunological mechanisms associated with the high risk of TB recurrence in HIV-infected patients

(iv) Impacting policies and practices aimed at reducing the burden of the dual TB HIV epidemics

(v) Building research capacity in South Africa

HEALTH IMPACT

Addressing challenges in scaling up TB and HIV treatment integration in public health settings in South Africa (SUTHI) implementation.

- The SUTHI study tested an innovative intervention-based approach to deliver optimal TB-HIV care within rural primary health clinics. Quality improvement methodologies addressing implementation of clinic processes led to improved survival rates in TB, HIV, and TB-HIV co-infected patients compared to the standard of care
- Precision public health medicine: The CAPRISA 011 IndeX study aims to demonstrate whether a gene derived drug-resistant TB (DR-TB) therapeutic regimen improves six months culture negative survival. In this study, results from TB Whole genome sequencing of drug resistant Mtb strains are used to develop and appropriate effective DR-TB regimen
- Metformin (MET) as host directed therapy for TB: this basic science project aims to elucidate the biologic plausibility of use of Metformin as host directed for TB using time-lapse microscopy to evaluate the impact of MET co-administration of Mtb growth inhibition and replication.

Professor Kogie Naidoo, Head of the Unit, with learners who visited the CAPRISA eThekwini Research Clinic in January 2020 for an insight into science as a career

Prof Kogie Naidoo with a participant at the CAPRISA eThekwini Research Clinic in January 2020

The PEPFAR supported CAPRISA Advanced clinical care (ACC) programme developed the following innovations being adopted currently by the NDoH for national scale-up

- A national Advanced Clinical Care training curriculum to enhance skill and capacity among doctors, specialists and pharmacists to better identify, manage and refer patients with complex TB and HIV TB
- Creation of virtual decision support platforms to enhance referral pathways and decision support for clinicians managing patients with complex HIV and HIV TB
- Creation of a systematic approach to making viral load monitoring routine – which has been adopted and taken to scale by Department of Health, South Africa and nine sub-Saharan African countries

The following CAPRISA research fellows have influenced further innovation through their research in basic science:

1. Post-doctoral research fellow Nikita Naicker focusing on the effect of metformin on macrophage phagolysosomal killing activity to investigate whether Metformin affects the ability of macrophages to control mycobacterium tuberculosis (Mtb).
2. Masters research fellow Senamile Ngema evaluating the use of high-dose isoniazid (INH) in the treatment of MDR-TB. To assess the bactericidal activity of INH on Mtb strains with katG with or without inhA mutations using time-kill kinetics analysis.
3. Masters research fellow Azraa Khan investigating targeted sequencing of Mtb genome to screen for putative mutations known to be involved in drug resistance.
4. Post-doctoral research fellow Anushka Naidoo assessing the efficacy and pharmacokinetics of twice daily bictegravir 50mg/emtricitabine 200mg/ Tenofovir alafenamide 25mg in HIV positive ART-naïve patients with TB receiving a RIF-based regimen

DIGITAL TECHNOLOGIES FOR HEALTH

Use of Internet of Things (IoT) and Big Data:

The Context study utilizes field workers to track social migration using global positioning system (GPS) devices. The data are collected and uploaded to a CAPRISA built web App. This allows us to import then point and plot co-ordinates obtained and integrate with collected field data. This system enables swift data validation. The data are represented on a Google Map to show points of social migration. Within the CAPRISA-supported PROMOTE an algorithm was developed to validate data from multiple sites across Africa to ensure final data sets sent for submission is accurate and clean. The previous method of cleaning data was manual and time-consuming resulting in two-three-week delays in final data validation. With the use of the algorithm – local site data managers are now able to use this tool to validate and highlight errors before submitting to the data warehouse. This process resulted in the data being checked, highlighting displayed errors within minutes.

Labware: Biorepository Management:

We developed and programmed an automated script to replace the tedious method of locating samples in our biorepository. Usually search terms matched data over multiple data sources, a process that would take one staff member 5 days. This has now been reduced to 10 minutes through on running a big query.

The PRAXIS study (2) utilises an electronic dose monitoring device, Wisepill RT2000 to monitor adherence in M/XDR-TB-HIV patients. Every time the Wisepill device is opened, the device sends a medication event to a central encrypted management system called the Wisepill Web Server. Medication records are stored securely on the Wisepill Database with secure access using the Wisepill Web Application. This study evaluates the impact of adherence technologies on treatment adherence, retention in care and survival among DR-TB patients.

We utilized state of the art technologies in our research demonstrating the impact individual patients' genetic

Professor Kogie Naidoo addresses delegates (medical doctors and specialists) who attended the Advanced Clinical Care (ACC) programme which was held throughout the KwaZulu-Natal province

variation on drug metabolism and clinical outcomes in TB-HIV co-infected patients. Our work in individualizing DR-TB therapy is expected to revolutionize healthcare through precision public health medicine in guiding appropriate drug regimen using gene derived signatures.

RESEARCH TRANSLATION

CAPRISA have been impacting science through policy, guideline development and practice to relevant stakeholders. The list below summarises the science citizenship activities of Professors Salim Abdool Karim, Nesri Padayatchi and Kogieleum Naidoo:

- Professor Salim Abdool Karim: UNAIDS Scientific Expert Panel, WHO: HIV-TB Task Force, HIV and Hepatitis Scientific and Technical Advisory Committee, Steering Committee on strategic use of ART and Gates' Foundation Scientific Advisory Board for Global Health
- Prof Nesri Padayatchi: Ethics Advisory Group of the International Union Against TB and Lung Disease (IUATLD), SA HIV Clinicians Society, Indian Advisory Group for the Indian Medical Research Council, SA National TB Think Tank and South African National Drug Resistance TB Advisory Committee
- Prof Kogieleum Naidoo: WHO HIV-TB Implementation for Impact Working Group and WHO guideline advisory committee, Medscape AIDS/Infectious Diseases Advisory Board, National TB Think Tank, Technical working group TB, KwaZulu-Natal Clinical Governance and Pharmacovigilance Committee and HIV Clinicians Advisory Board

Attendance at the following conferences, workshops and seminars have translated scientific research to public health knowledge; INTEREST 2019, AWACC 2019, SA AIDS, 2020 CROI, 2020 Keystone TB and finally maximising the impact of research through publications and implementation guides including; medical focus publications, regular updates to TB treatment guidelines, NDoH national ACC curriculum, Guide to Making Viral Load Monitoring Routine for Improving Patient Outcomes, Radiological Features in TB-HIV co-infected patients, Step by step guide for the Management of Children and Adolescents on ART and DR TB Toll Free Helpline: A Best Practice for Improving Referrals and Clinical Decision Support . Media and press events to disseminate updated and alerts in HIV/TB on regular radio talk shows, news television channels, social media platforms, call in programmes, and symposia.

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The CAPRISA-SAMRC HIV-TB Pathogenesis and Treatment Research Unit located in the epicentre of the HIV epidemic in South Africa aims to reduce mortality in patients with both HIV and tuberculosis. Having contributed to the current WHO co-treatment guidelines, the unit's suite of studies includes therapeutic trials, implementation trials, long-term longitudinal cohorts and laboratory research on the biological mechanisms of HIV and TB interaction at a cellular level. In pursuing novel scientific evidence to design and test sustainable solutions to reduce the morbidity and mortality from HIV-TB co-infection, the unit has a strong focus on the future of science, technology and innovation.

– Prof Salim S. Abdool Karim

SAMRC/NHLS/UCT MOLECULAR MYCOBACTERIOLOGY RESEARCH UNIT

Unit Director: Valerie Mizrahi

OVERVIEW

Research in the SAMRC/NHLS/UCT Molecular Mycobacteriology Research Unit (MMRU) is aimed at investigating aspects of the physiology and metabolism of Mycobacterium tuberculosis most relevant to the discovery of new drugs for tuberculosis, to understanding the aerobiology of tuberculosis, and elucidating the molecular mechanisms that underlie the evolution of drug resistance in this pathogen.

By exploiting its expertise in mycobacterial genetics, genomics and physiology, researchers in the MMRU apply state-the-art technologies, including mycobacterial genomics, metabolomics, advanced microscopy and other single-cell approaches to tackle major scientific questions pertaining to the biology of M. tuberculosis with the aim of contributing to the development of new tools to control TB. The research programmes embedded within the MMRU serve as the vehicle for developing the next generation of researchers.

HEALTH IMPACT

Pathogen sequencing enables a rapid response to public health emergencies including insights into transmission dynamics and disease progression. Pertinent to this eco-system is the need for reproducible analytics and standardized protocols for data storage and access to pathogen biological specimens.

The MMRU has been working on different elements of pathogen surveillance including data storage (COMBAT-TB-NeoDB), workbench (COMBAT-TB; www.combattb.org), visualisation (COMBAT-TB-Explorer), and biospecimen tracking (Baobab LIMS; www.baobablims.org). These tools have been used by other researchers in the country.

Between 2008 and 2010, outbreaks were reported in all nine provinces with 232 confirmed infections in humans, and 26 confirmed deaths. The Molecular Mycobacteriology Research Unit is investigating the epidemiological history of Rift Valley Fever Virus circulating in South Africa and in other African countries. The results of this study have the potential to inform governmental policy aimed at restricting the movements of infected livestock across national borders with impact on human health.

Innovative public engagement

The Molecular Mycobacteriology Research Unit has developed a public engagement tool (Speaking book on Biobanking) to communicate the importance of biomedical research and biobanking to the public. The results of this intervention show significant improvement in knowledge acquisition by the public and an interest in donating biospecimens for future biomedical research; this tool is poised for roll out at clinics and public libraries.

Policy and Practice

One highly innovative project focuses on the aerobiology of TB transmission. In this project researchers in the MMRU are working with colleagues in the Desmond Tutu HIV Centre and Foundation to develop new ways of detecting and quantifying metabolically active M. tuberculosis organisms in the bioaerosols that are produced by TB patients through coughing or breathing. The MMRU is responsible for this highly interdisciplinary project which brings together clinicians, epidemiologists, engineers, microbiologists and analytical biochemists.

The MMRU aims to impact on TB control by applying technological advances in single-cell microbiology, high-resolution microscopy and other innovative approaches to better understand the aerobiology of Mycobacterium tuberculosis, as applied to TB transmission, and to discover novel antimycobacterial agents. We will achieve this objective through interdisciplinary research at the laboratory-clinic interface which will be used as the vehicle for training the next-generation of TB researchers.

– Prof Valerie Mizrahi

Researchers at the MMRU have developed a powerful analytical platform using advanced imaging techniques to detect bacteria in bioaerosol samples captured from TB patients. This work formed the basis of a five-year grant from the US National Institutes of the Health and a prestigious MIT-Africa-Imperial College London seed fund award.

The second project uses a combination of CRISPR interference technology and microscopy to investigate the function of genes that encode biochemical functions that are essential for mycobacteria to grow and survive. The

method entails using this powerful new genetic tool to specifically deplete essential proteins, and use microscopy to image the bacteria, and thereby reveal the way in which the bacterium's shape changes when it is starved of the particular protein.

This has led to the creation of an atlas of so-called "morphotypes" which have been analysed and grouped using a combination of semi-automated imaging and machine learning. One of the practical applications of this technology is in helping to understand the mechanism of action of drugs that kill mycobacteria – an essential part of TB drug discovery.

DIGITAL TECHNOLOGIES FOR HEALTH AND RESEARCH TRANSLATION

The atlas of morphotypes of mycobacteria in which the ability of the bacterium to produce a given essential protein is blocked (described previously) represents a major data-rich resource. A website containing the key atlas data has been developed and will be made available as an online resource concomitant with submission of the manuscript describing this work to an Open Access journal.

The major public engagement organisation with which the MMRU interacts very closely is Eh!Woza (www.ehwoza.com). This programme, which has become a premier platform for public engagement around TB (and other health issues) was initiated in the MMRU and 2013. It aims to increase TB awareness in communities where this disease has the biggest impact, as well as to educate learners (aged 15 – 17) living in these communities about the intricacies of biomedical TB research. Researchers in the MMRU have continued to participate actively in leading the science workshops arranged by Eh!Woza. Besides this, the director and others engage with the local and international media and are frequently interviewed and quoted.

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SAMRC/NHLS/WITS RESPIRATORY AND MENINGEAL PATHOGENS RESEARCH UNIT

Unit Director: Shabir Madhi

OVERVIEW

Respiratory and Meningeal Pathogens (RMPRU) conducts epidemiological, clinical and basic science research on vaccine preventable diseases, aimed at enhancing the health and survival of African children. In line with the SAMRC's strategic plan of research transformation, the Unit has further evolved to focus specifically on the epidemiology and prevention of infections during the neonatal period. This is pertinent, as deaths during the first month of life, one-third of which are due to infections, are responsible for 40% of all under-5 mortality.

Included in the portfolio of work on neonatal infections are the clinical and molecular epidemiology and prevention of Group B Streptococcus, which is the leading cause of neonatal sepsis in South Africa. The Unit has embarked on programmes aimed at vaccinating pregnant women to confer passive immunity and protect infants during their first few months of life. These include studies on the influenza vaccine, GBS conjugate vaccine, pertussis vaccine and RSV vaccines being given to pregnant women, which is a classic example of research translation from the lab and the numbers into common clinical practice.

HEALTH IMPACT

RMPRU is internationally recognised for the role it has played in the clinical development of live-saving vaccines such as the rotavirus vaccine and pneumococcal conjugate vaccine. Furthermore, it has been at the forefront of vaccine studies aimed at pregnant women, including reporting on the first placebo-controlled randomized trial of the influenza vaccine in pregnant women. It has also undertaken the first studies of an investigational multi-component Group B Streptococcus conjugate vaccine in pregnant women; a portfolio of research that is ongoing-including discovery research on other potential GBS vaccine epitopes. This is highly relevant to Africa and South Africa, which has reported the highest incidence of invasive GBS disease globally.

One of the larger ongoing grants received from the Bill and Melinda Gates Foundation was for the Child Health and Mortality Prevention Surveillance (CHAMPS) study. The Chair is the South African Principal Investigator on the multi-center CHAMPS study which aims at conducting minimal invasive tissue sampling to better ascertain the causes of stillbirths and under-5 deaths in high morbidity and mortality settings. The RMPRU championed the piloting of MITS, which resulted in the committed funding and continuation of the study through CHAMPS. The CHAMPS programme further evolved into the establishment of a Health and Demographic Surveillance Site (HDSS) in Soweto, one of the first of its kind in an urban-African setting. The HDSS focuses on the surveillance of pregnancy outcomes and under-five childhood deaths.

Policy and Practice

i. Rotavirus Vaccine Studies:

The Unit, under Dr Michelle Groome, undertook the first study on a sub-unit rotavirus vaccine, which is being developed as a possible improvement to the current live-attenuated rotavirus vaccine, the clinical development of which also was spearheaded in Africa at RMPRU. These results were published in Lancet Infectious Diseases. Since the introduction of rotavirus vaccine into the South African public immunization programme, it has been estimated to prevent 3000 fewer diarrhea-related deaths in South Africa each year, as well as approximately 39,000 fewer hospitalizations

ii. Pneumococcal Vaccine Studies:

The Unit continues research on the prevention of pneumococcal disease through vaccination with the pneumococcal conjugate vaccine. This includes the work of two PhD students, which has investigated the direct and indirect benefits of vaccination. Included in this are studies which have shown that since South Africa introduced pneumococcal conjugate vaccine (PCV) into its public immunization programme, based on evidence generated by RMPRU, annually more than 300 children's lives are saved and there are approximately 125,000 fewer pneumonia hospitalizations in children, compared to prior to vaccine introduction.

The Vaccines and Infectious Diseases Analytics (VIDA) Research Unit of the University of the Witwatersrand, formerly the Respiratory and Meningeal Pathogens Research Unit (RMPRU), has over the past 24 years established itself as an internationally recognised African-led research unit in the field of epidemiology of vaccine preventable diseases, and clinical development of life-saving vaccines. Current focus areas include next generation vaccines against rotavirus and TB, as well as development of novel vaccines targeted at pregnant women to protect their young infants against the leading causes of sepsis (Group B Streptococcus vaccine) and pneumonia (Respiratory Syncytial Virus vaccine) during early infancy. Furthermore, VIDA is one of seven participating units in the multi-country Child Health and Mortality Prevention Surveillance (CHAMPS) programme, which aims at providing refined estimates as to the causes of stillbirths and under-5 childhood deaths in low-middle income countries (LMICs). In 2020, VIDA embarked on leading the first two COVID-19 vaccine studies being undertaken on the African continent, and has undertaken multiple epidemiological and immunology studies on COVID-19 in health-care workers, adults and pregnant women. The translational research undertaken at VIDA continues to inform local and global policy recommendations on the use of life-saving vaccines in the public immunisation programmes of low-middle income countries.

– Prof Shabir A. Madhi

iii. Group B Streptococcus:

The Chair has also developed a strong research agenda in the field of Group B Streptococcus disease. Included among these were the first studies to show the association between immune mediators and risk of recto vaginal GBS acquisition during pregnancy, as well as studies on correlates of protection against invasive GBS disease in Africa. RMPRU were also proud organizers and hosts of the first International Symposium on Streptococcus Agalactiae Disease. This symposium brought together international experts and key stakeholders in the field of GBS and was aimed at progressing towards a GBS-free population. The Symposium had over 250 local and global attendees.

iv. Stillbirths and Infant Mortality:

Studies by the Chair have established GBS to be an important contributing cause to not only neonatal death, but also stillbirths in South African women. These studies will be important in informing the design for future vaccines aimed at immunization of pregnant women to improve their birth outcomes and prevent invasive disease in their young infants.

v. Vaccinology:

RMPRU in partnership with the NICD and ALIVE has hosted the first and second Advanced Vaccinology course in Africa (Afro- ADVAC), which is ten days long and takes place in Muldersdrift, South Africa. The course involves presentations and workshops led by international and local experts in the field of vaccinology and immunology. Delegates from over 32 African and Asian low-to-middle-income countries participates in this course, which is planned to take place every second year.

RESEARCH TRANSLATION

The Unit operates on a philosophy of open-access and has been collaborative in making its data available to other groups, including for the use of higher degree purposes and for pooled and meta-analysis. Also, much of the grant funding is from the Gates Foundation, which as part of the grant conditions, requires data sharing within one year of completion of the study.

The unit also has a large output of journal articles every year, published by the director, his colleagues and postgrad students. Most of these papers are accessible to the general public and fellow professionals in the field.

Lastly, the RMPRU has played host to many international conferences and symposiums, bringing together experts, students and like-minded people for sharing ideas, information, science and future prospects.

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AIDS AND TB RESEARCH UNIT

AIDS and TB Research Unit includes REPORT TB, the TB Platform and Social Impact Bond

Unit Director: Fareed Abdullah

THE REGIONAL PROSPECTIVE OBSERVATIONAL RESEARCH FOR TUBERCULOSIS (REPORT TB)

OVERVIEW

Tuberculosis (TB) claims more human life than any other bacterial pathogen and continues to stand out as a clear and present danger to global health. The Regional Prospective Observational Research for Tuberculosis (RePORT TB) Consortium was established to address challenges around developing biomarkers for TB infection, disease and treatment response.

It comprises a partnership between numerous high TB burden countries including, Brazil, China, India, South Africa and more recently, the Philippines. RePORT TB is founded on the principle of establishing patient cohorts in these settings following a common recruitment and sample collection protocol to establish a biobank of specimens that can be used for biomarker, diagnostic and related research endeavours.

The common protocol allows for specimen collection in two cohorts designated as Cohort A and Cohort B, the former comprising participants with drug susceptible TB and the latter the household contacts of these individuals. Specialist cohorts such as those that encompass paediatric TB are also included.

HEALTH IMPACT

i. Research

The South African RePORT TB consortium comprises five sites and has facilitated multidisciplinary research in six of the nine provinces in the country, including regions that battle with extremely high incidences of TB. The research priorities include the testing and evaluation of existing biomarker signatures across different cohorts from the participating countries to yield a harmonised signature with strong predictive power.

Appended to this is testing of novel culture methods together with PET-CT findings and evaluation of host mRNA as measures of treatment efficacy. The assessment of novel case finding modalities and testing of these in high and low incidence communities to evaluate effectiveness represents another important priority.

TB in children has long been neglected and management of these cases is hampered by the poor performance of current molecular and culture-cased diagnostics. To address this, the South African RePORT consortium has developed a focus on testing the performance of new molecular diagnostics in specimens isolated from children.

ii. Innovative approaches

The RePORT consortium brings together unique data sets that allow for an innovative view of biomarker performance related to clinical presentation of disease and infection. The use of approaches such as PET-CT scanning, to determine durability of treatment response, and whole genome sequencing, to assess drug resistance, enhances the value proposition of the work.

An important component of the END TB Strategy is the development of new treatment regimens that are able to rapidly eliminate persister bacteria and thus reduce treatment duration. To address this, a study of persister organisms, their rates of clearance and how treatment affects host bioenergetics has also been included in the broader ambit of research. Finally, the deployment of new diagnostic tests at a point-of-care level, using novel approaches represents another important focus of the consortium.

Policy and Practice

i. Policy and practice in South Africa and globally

Through the use of a common protocol the RePORT consortium has capacitated laboratories within South Africa and in partnering countries for the collection of a congruent set of samples that will represent a unique resource in the world. There has been substantive transfer of skills between the South African RePORT consortium in terms of sample collection, data harmonization and analysis of the collected specimens.

The optimized practices have formed the basis of a second application to fund the consortium, with additional members, for a further three years. This application was submitted in March 2020.

ii.Influenced further research or innovation

Within the RePORT consortium, various sub studies nested within individual sites have yielded interesting outcomes that will help shape a new set of research priorities. Examples of these include a SA-Brazil Cross-Consortium Collaboration entitled: Towards a global TB biomarker – Comparison of small transcriptomic signatures to predict, diagnose and monitor TB disease in Brazil and South Africa.

This study aims to develop a harmonized biomarker signature that can be applied to different populations with robust results. Further examples include correlation analysis between sputum mycobacterial mRNA detection and novel culture methods with PET-CT findings, host mRNA, and cytokine markers in blood, in DS-TB patients receiving standard of care or a shortened treatment regimen. These efforts are expected to yield new hypotheses that can be tested in larger cohorts.

The study of infection resistance, especially in settings such as the household, holds particular promise for developing new vaccines. This has been a strong focus for the RePORT team, which aims to assess characteristics of the GeneXpert MTB/Rif Ultra diagnostic test, now deployed in the South African healthcare system, against liquid culture in all household contacts (irrespective of symptoms) and to identify household contacts who remain uninfected despite substantial exposure.

Within these individuals, genetic and metabolomic characteristics associated with infection resistance to TB will be studied as an important future priority. From a diagnostic perspective, the sensitivity and specificity of GeneXpert Ultra, performed on induced/expectorated sputum, nasopharyngeal aspirate, urine and stool, in comparison with a microbiological reference standard for diagnosis of TB in children will also be assessed.

DIGITAL TECHNOLOGIES FOR HEALTH

The RePORT consortium will take advantage of new data analysis algorithms that have emerged from 4IR approaches that allow for the integration of various biological samples sets in innovative ways. An example of this includes a study aimed at quantifying the infectiousness of untreated TB cases in the community identified through an intensive case finding approach, using cough aerosol sampling technology (CASS) that allows for capture and analysis of bacteria expectorated by individuals.

This study will characterize clinical and bacteriological characteristics of the infectious cases identified by CASS, through radiological imaging and investigation of the genome, transcriptome and lipid content of the bacteria isolated by CASS. These findings will then be related to infectiousness by matching genome sequences of prevailing cases geospatially in settings using 4IR approaches.

With regard to biomarker signatures, a collaboration with the RePORT Brazil team, using novel machine learning algorithms is expected to facilitate the development of harmonized biomarker signatures. The identification of a harmonized biomarker signature with good predictive capacity will enable the development of diagnostic tools that use this signature in a cartridge-based test at point-of-care. The use of PET-CT, combined with artificial intelligence and computer assisted diagnosis (CAD), is also expected to yield novel digital health technologies

RESEARCH TRANSLATION

The operational performance of diagnostic tools such as the GeneXpert, which is already used in the health care system, represents an important area where the SA TB RePORT consortium is shifting the research landscape to enable better TB diagnosis for the general public. An estimated 40% of TB remains undiagnosed and untreated in the community, which contributes to disease amplification. In this regard, active case finding (ACF) is critical to reduce the transmission of TB.

It has been demonstrated that ACF using a large vehicle with a standard 4 module GeneXpert and an on-board generator, was an effective tool for community-based case finding. Recently, Cepheid introduced a mobile GeneXpert platform (Omni). Members of the RePORT consortium have undertaken to investigate whether ACF for TB, using this portable molecular diagnostic in a scalable low-cost mobile multi-purpose vehicle, would be a feasible and effective strategy to screen for TB and HIV in the community. This is the first RCT evaluating the utility of a portable molecular diagnostic for ACF and is expected to yield important results for strengthening TB care.

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TUBERCULOSIS PLATFORM

Unit Director: Martie van der Walt

OVERVIEW

The TB platform undertakes research in developing relevant knowledge and tools for prevention and treatment of tuberculosis through building a new generation of South African scientists equipped with cutting edge skills for reducing the burden of tuberculosis in South Africa.

Our research is in line with the SAMRC's core value which is "to improve the health of the nation through research" and has contributed to the organisation's Strategic Goal 02: "Lead the generation of new knowledge and facilitate its translation into policies and practice to improve health" through the peer reviewed papers published.

During the period under review, the TB Platform has supported the SAMRC Strategic Goal 03 which is to "support innovation and technology development to improve health", through the development of an innovative point of care assay for diagnosis of tuberculosis and HIV in collaboration with the Council for Scientific and Industrial Research (CSIR).

HEALTH IMPACT

i. Research

In line with the organisation's commitment to build the next generation of scientists that will impact on the lives of South Africans, the TB Platform has supported two staff members with their PhD studies and one candidate obtained an M-degree – they are all female staff from previously disadvantaged backgrounds.

ii. Innovation

HIV/AIDS mortality is due to opportunistic illnesses/ infections that take advantage of the weakened immune system in infected individuals. In Africa, the most common of these opportunistic illnesses include infection by Mycobacterium tuberculosis (M.tb) responsible for tuberculosis (TB).

The TB Platform, together with the Council for Scientific and Industrial Research have developed a point of care (POC) multiplex microarray technology for simultaneous detection of HIV and M.tb in blood that will reduce time and cost associated with the diagnosis of these diseases. The microarray based diagnosis technology will involve the detection of antibodies against HIV p24 antigen as well as antibodies against M.tb antigens ESAT6/CFP10, apa and pstS1 that together are markers of active tuberculosis. This technology will be complemented by the development of a portable, battery powered, low-cost fluorescence reader medical device for detecting antibodies against these antigens at POC.

Currently there is no technology for simultaneous detection of HIV and M.tb. Furthermore, all current tests for diagnosis of TB have limitations of requiring sophisticated equipment. The assay does not require laboratory infrastructure or sophisticated equipment and is very suitable for use in resource-limited and remote settings. It reduces the cost of HIV/TB diagnosis by testing both pathogens simultaneously and reduces the time of diagnosis since the test is done at the first contact with the patient in the consulting room.

iii. Policy and Practice

The Tuberculosis epidemic in South Africa is driven by the high burden of HIV, while on the other hand people living with HIV are at high risk of contracting TB. An essential strategy to control TB is prevention of TB among this population through preventive therapy which includes the drug isoniazid (IPT). HIV-infected pregnant females are at even higher risk to contract TB than non-pregnant women of reproductive age, and mortality and morbidity during pregnancy also impact adversely on the health of their infants. Provision of IPT to the HIV infected pregnant women reduces mortality while it may also lead to better pregnancy outcomes when initiated during pregnancy.

We analysed the data of 1,215 HIV positive pregnant women who participated in a study to determine the optimal integration of TB and HIV among pregnant women (iTHAMBy) and found that less than 20% of the women had received IPT prior to the pregnancy while an additional 37% received IPT during pregnancy. Our work showed that isoniazid preventive therapy (IPT) can safely be used in pregnancy but more importantly that IPT exposure during pregnancy results in higher proportions of live births as compared to individuals who had not received IPT during pregnancy.

Persons on preventive treatment are required to adhere to treatment to ensure high levels of protection, but the methods available to monitor adherence are biased due to stigma associated with preventive therapy.

SAMRC colleagues visiting the Prevalence Survey research site meeting with research participants and investigators from other organizations.

The IsoScreen colorimetric assay can detect the by-products of isoniazid metabolism in urine, which is an objective measure of isoniazid intake during the past 24-30 hours. We have used the IsoScreen assay to measure adherence to isoniazid preventive therapy among pregnant women who participated in the iTHAMBy study, where we found that most of the women said that they had taken isoniazid while the IsoScreen showed the contrary. In patients where a discordance between self-report and IsoScreen is found, it is an indicator to the healthcare provider to counsel the person on the necessity to be adherent to preventive therapy. At least three different regimens for TB preventive therapy are being rolled out in the country which will be accompanied by a renewed interest in objective measures to determine adherence to therapy.

Our work on IsoScreen shows that the assay is suitable to be used point of care and feasible to use as an intervention to prompt counselling of the person.

DIGITAL TECHNOLOGIES FOR HEALTH

Tuberculosis is primarily a disease of the lungs, and the most sensitive way to diagnose TB is with chest X-rays. The appearance of cavities in the lungs is unique to tuberculosis and therefore reading of CXR is very suitable for automated reading through machine learning applications.

Typically, the automated reading applications are trained on a reference CXR data set followed by reading of a dataset from a clinical cohort. The CXR data set of the First National Tuberculosis Prevalence Survey, South Africa, 2018, represents a unique reference dataset as it includes images of 35,191 individuals from across the country, and the images are supported with other data on pulmonary TB.

Even though the machine learning applications are trained for tuberculosis, they should also be able to detect lung abnormalities typical of silicosis and other lung pathologies such as pneumoconiosis. Silicosis is a major occupational disease among people working in gold mines, it causes severe mortality and morbidity, with the accompanying compensation for workplace acquired diseases. The Prevalence Survey data set of the chest X-ray images is used to determine the sensitivities of South African developed applications for diagnosis and differentiation of tuberculosis, silicosis and pneumoconiosis among mine workers.

The identification of a harmonized biomarker signature with good predictive capacity will enable the development of diagnostic tools that use this signature in a cartridge-based test at point-of-care. The use of PET-CT, combined with artificial intelligence and computer assisted diagnosis (CAD), is also expected to yield novel digital health technologies.

RESEARCH TRANSLATION

The social mobilization and community engagement activities for the First National Tuberculosis Prevalence Survey, South Africa, 2018, offered several opportunities to communicate the research of the Tuberculosis Platform and the SAMRC to the general public and other stakeholders such as local government structures and community forums.

Radio interviews on one of the national broadcaster's channels during peak hour traffic reached a diverse audience, while the interviews in community newspapers and radio reached a smaller but much more target audience. The radio interview during August 2019 to celebrate Women's Month was an opportunity to disseminate information on the research conducted among pregnant women and how to protect them from contracting tuberculosis and HIV.

One podcasted radio interview was published on the SAMRC website and messages about the TB Platform research were posted on social media platforms. The profile of SAMRC research and the 50th celebration of the SAMRC was additionally communicated through the placing of 50th year banners at TB Prevalence Survey sites in communities and handing out of 50th year celebration folders with information on SAMRC to the prevalence survey participants.

At the second World Health Organization's Africa Health Forum the two innovations of the TB Platform together with the Council for Scientific and Industrial Research were presented to a diverse audience of stakeholders such as ministries of various sectors of the government as well as health experts, academics and public and private investors and other African innovators.

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The tools of the 4IR revolutionize the way that healthcare is delivered, especially in remote and rural areas where sophisticated technology is not always available. It frees up resources and the time of healthcare providers that can be spent on other priorities.

M-Health makes it possible that healthcare providers can now use cellphones to communicate with their patients without the patient having to come to a clinic for routine follow up visits, while artificial intelligence applications for automated reading of chest X-rays makes it possible that a person can have chest X-ray done without the need for a doctor to be present. The AI application will immediately read the image and via the internet inform a doctor, based elsewhere, about the result. Through the internet the doctor and the on-site health providers can discuss the image and how to treat the patient.

"Over the next years we will investigate these new technologies to find the ones that will benefit patients and healthcare providers."

– Prof Martie van der Walt

SAMRC researchers reaching out to communities to explain how current research will benefit their health and well-being.

SOCIAL IMPACT BOND

OVERVIEW

The Social Impact Bond (SIB) for adolescent girls and young women (AGYW) that was developed during the year under review is well aligned with the SAMRC focus in that it ensured collaboration between researchers to advance the evidence available for an impactful intervention for AGYW and included new stakeholders in this collaboration including private investors and experts in impact investing. This collaboration aims to specifically transform the funding platform to support excellence in AGYW programming and ultimately the impact on HIV incidence, teenage pregnancy and gender-based violence amongst this vulnerable group that is needed.

The SIB also built on the 2018/19 theme of the value of pioneering as it is one of the few SIBs in South Africa and the only one that focuses on health outcomes.

HEALTH IMPACT

i. The SIB supported research around the gaps in evidence and knowledge about what constitutes the best intervention package for adolescent girls and young women if we want to substantially improve HIV and pregnancy outcomes for AGYW. This has led to the development of an evidence-based package of interventions that will be implemented through the SIB mechanism.

ii. The SIB is a form of innovative financing that serves to raise funds from the private sector, where the private investor provides the upfront funding for implementation of the intervention and the government only pays the investor if the outcomes are achieved.

Together these have the potential to change the way HIV comprehensive programmes for AGYW are done, substantially enhance the funding available for future SIBs

that can address areas with great potential to contribute to HIV and TB epidemic control but where funding is scarce, to enhance knowledge translation through expanded collaborations and transformation through an increase in the number of research projects and opportunities. The former will be tested by a pragmatic randomised cluster-controlled study and the latter few through ongoing analyses and information sharing to determine the full transformative effect on the SAMRC and the country.

Policy and Practice

i. The SIB for adolescent girls and young women aims to impact the implementation of the Integrated School Health Policy in South Africa. Whilst the Department of Basic Education has an HIV strategy and an Integrated School Health Programme (ISHP), these have not yet been fully implemented successfully to achieve the expected impact on HIV incidence and teenage pregnancy and research on how best to achieve this is ongoing.

ii. The SIB for adolescent girls and young women supported further research through enhancing the analyses done by research studies e.g. HerStory and contracting new research in some areas e.g. with sex workers.

DIGITAL TECHNOLOGIES FOR HEALTH AND RESEARCH TRANSLATION

The SIB plans to implement real time data collection, collation and advanced analyses of the information collected in relation to other data sources, economic analyses including review of unit costs and value for money and seamless tracking and monitoring of adolescent girls and young women between service points.

In terms of our work's contribution towards improved (digital) technologies for health, the SIB aims to test the use of a patient held health card that stores all their health data allowing easy movement between service sites.

The research commissioned was concluded at the end of this financial year and therefore has not yet been fully analysed for translation. However, the SIB team participated in the SANAC Youth Technical Working Group to share interim lessons and setting the scene for future translation of research findings into the relevant structures that influence policy and guidelines development.

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The SAMRC Office of AIDS and TB Research will launch and lead the implementation of a Social Impact Bond (SIB) focusing on improving HIV and teenage pregnancy outcomes amongst adolescent girls and young women in high schools. This will be the first of many SIBs, as we move to innovate in the area of financing for health and broader social change whilst building on SAMRC's ever expanding ability to lead research necessary for knowledge translation and policy change, thereby building sustainability for such change.

– Dr Nevilene Slingers

SAMRC/UCT CENTRE FOR THE STUDY OF ANTIMICROBIAL RESISTANCE

Unit Director: Keertan Dheda

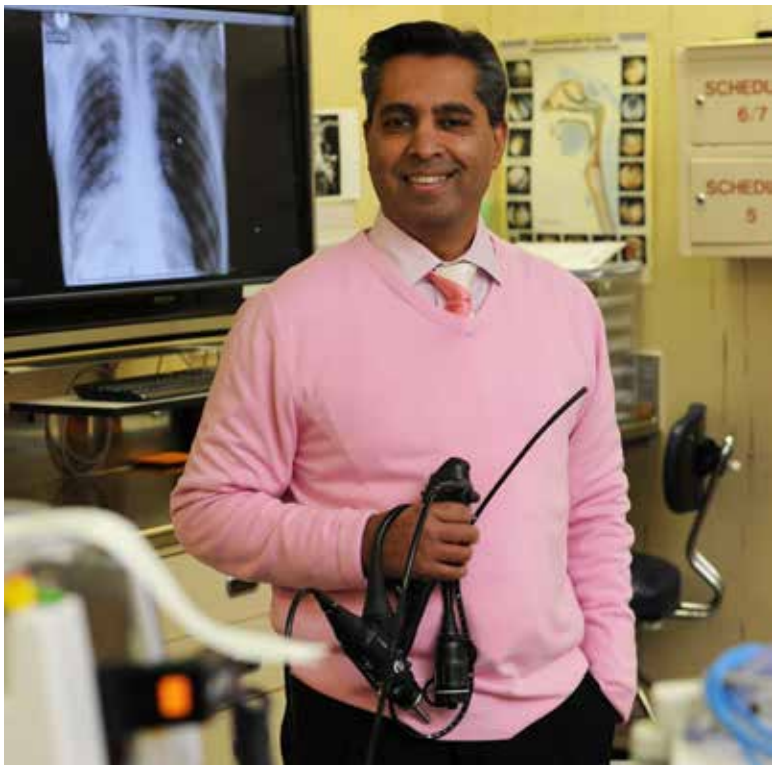
OVERVIEW

Antimicrobial resistance (AMR) is a major problem in South Africa where multi-drug resistant (MDR) bacterial infections are becoming increasingly common and are now considered a national health priority by the Department of Health. In particular, drug-resistant tuberculosis (TB) threatens to reverse any gains made in controlling the TB epidemic in the country. The Centre for the Study of Antimicrobial Resistance (CAMRA) consists of a multidisciplinary team of national and international researchers which aims 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 such as development of inhaled antibiotics.

HEALTH IMPACT

Several novel and innovative approaches are being used by CAMRA to study AMR. Firstly, our access to explanted lungs from incurable TB patients allows us to study mechanisms of drug resistance amplification at the disease site including pharmacokinetic (PK) mismatch. This involves novel mass spectrometry assays and use of mathematical models to determine the relationship between drug levels (using novel drugs) and bacterial minimum-inhibitory-concentrations across TB cavities. Lung tissue within TB cavities are also analysed using flow cytometry and -omics techniques (genomics, transcriptomics) to understand what bacteria-specific factors or host immune mechanisms are involved in resistance amplification.

We also use targeted deep genomic sequencing to identify small resistant populations of bacteria directly from sputum or the site of disease in order to improve the detection limit of our current TB drug resistance assays. Finally, in conjunction with our collaborators in Italy, we have developed an inhalable dry powder formulation for levofloxacin which is GMP certified for use in humans (formulations of other TB drugs are being developed). We are currently optimizing stability and shelf-life. We plan to acquire further funding to perform a phase I trial to determine its safety and efficacy in a small group of patients.



Policy and practice

(i) Our work on AMR is in the early stages of research and development and we will need to perform validation studies and/or clinical trials to determine the efficacy of our approaches. However, if successful, we expect our research will be impactful and will change health policy and clinical practice for managing drug resistant infections in South Africa and globally.

(ii) Our work on PK mismatch host RNA profiles in TB cavities generated two high impact publications in the American Journal of Respiratory and Critical Care Medicine and has demonstrated that (i) several TB drugs used for the treatment of drug resistant TB are unable to penetrate the TB cavity leading to sub optimal therapeutic drug concentrations and is likely a major contributor to the development of drug resistance (ii) sputum, which is currently used to diagnose drug resistance does not predict the drug resistance profile in the lung very well (iii) the downregulation of several immune pathways in the TB cavity centre may serve as biomarkers of disease progression or potential targets for immunotherapy or vaccine design.

These finding have spurred several research questions including (i) determination of the drug penetration profiles of newer TB drugs and (ii) further characterization of several novel dysregulated host immune pathways in the lung to facilitate the identification of novel biomarkers that could inform the design of future TB vaccines. We also plan to extend these study designs to other respiratory MDR pathogens. Finally, we aim to develop and test the efficacy of adjunctive inhaled antibiotics as a novel treatment approach for incurable TB patients. We have already developed formulations for one second line TB drug and others are currently being designed. We expect to conduct phase I and II studies to determine safety and efficacy of these treatment strategies once more substantial funding is obtained. Furthermore, a long-term goal is to build capacity and infrastructure at UCT to create a platform to develop these drugs at UCT.

DIGITAL TECHNOLOGIES FOR HEALTH AND RESEARCH TRANSLATION

Several of our studies, including our lung explant work is generating large datasets through the use of novel -omics technologies (genomics, transcriptomics, proteomics, microbiome studies of the lung, etc) using both the host and the TB bacteria. These large datasets require novel approaches for analysis, storage, security, ease of access and sharing among other researchers. We are currently using UCT servers for storage and data transfer but hope to utilize newer and more efficient technologies as they arise.

Antimicrobial resistance (AMR) is one of the biggest challenges facing mankind in the 21st century. South Africa, unlike many resource-rich countries, faces the 'double challenge' of both non TB and TB related AMR. Indeed, drug-resistant TB threatens to destabilise TB control and is responsible for at least a third of TB related mortality (TB is now the most common cause of death in South Africa far exceeding the numbers killed by Covid-19). The AMR Unit's focus is on the study of tissue versus blood concentrations of TB and non TB related antibiotics (pharmacokinetics) and how these relate to pathogen kill and clinical outcomes (pharmacodynamics). CAMRA's experimental studies involve the interrogation of lung and non lung tissues and the impact of inhaled antibiotics as a strategy to prevent AMR to mycobacterial and bacterial drug-resistant pathogens causing serious infections.

– Prof Keertan Dheda

Generation of large data sets as mentioned above provide a 'global picture' of host-pathogen interactions. In conjunction with our partners in the U.S., we used a novel dynamical sink mathematical model for pharmacokinetic and transcriptomic mapping of the TB cavities to determine their relationship with bacterial MICs as well as interaction of different pathways along each cavity position.

Targeted deep sequencing has the potential to rapidly diagnose drug resistance in several pathogens, including TB. This technology is particularly useful in TB due to the delays in diagnosis. We are also evaluating the use of targeted deep sequencing for rapid diagnosis of drug resistant TB to improve patient health. However, implementation of such technology will require training of African scientists in bioinformatics and digital infrastructure upgrades. If impact on patient care can be demonstrated then these upgrades and training can be easily motivated to relevant policy makers

Our work is often disseminated through several avenues. Prof Dheda has presented this work extensively at lectures worldwide and through high impact publications to inform academia and other relevant stakeholders. We are also often covered by the media (broadcast, print, online) and post relevant research on our website to disseminate information to the general public.

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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
2. Biostatistics Research Unit
3. South African Cochrane Centre
3. Health Systems Research Unit
4. SAMRC/UWC Health Services to Systems Research Unit

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 Directors: Victoria Pillay-Van Wyk and Richard Matzopoulos

OVERVIEW

The Burden of Disease Research Unit (BODRU) has provided accurate and reliable burden of disease estimates that describes transformations in health status across South Africa, patterns of disease and emerging priorities. Multidisciplinary approaches are used, drawing on epidemiology, demography and biostatistics. Expertise has been developed in the areas of summary health measures, health surveys, the analysis of mortality data, cancer registration and health informatics. Monitoring the country's health status and determinants of disease is an essential foundation for guiding policy and programmes to improve life expectancy and quality of life. The Unit contributes essential information for setting priorities and monitoring progress in the health sector. We have identified disparities in health status by province and population group and strengthened population-based health information systems through our research.

HEALTH IMPACT

The Unit revealed the quadruple burden of disease affecting South Africa, which has impacted on research priorities. Findings from our national burden of disease study has contributed not only towards the restructuring of the SAMRC in 2012, but also the identification of health interventions to improve the health of the nation for each of the major disease burdens. The methodology developed for our second national burden of disease study was adopted by the Western Cape Department of Health for their Western Cape Mortality Surveillance System.

With regard to HIV/AIDS the Unit provided the first clear indication of this epidemic on mortality, which was an important catalyst for the implementation of antiretroviral treatment. The national statistics office, Statistics South Africa (Stats SA) report what is written on the death notification form and do not adjust the data for miss-attributed HIV/AIDS deaths that occur due to stigma and discrimination. BODRU has developed a model that provides more feasible numbers and trends of HIV mortality for South Africa addressing the challenge of miss-attributed HIV/AIDS deaths.

Due to the delays in the release of mortality data from Stats SA, a Rapid Mortality Surveillance (RMS) system was established to enable an urgent response to maternal and child mortality trends.

For non-communicable diseases (NCDs) , our Eastern Cape Cancer Registry provides the only rural African population-based estimates that are internationally recognised. The Unit also managed the SA Demographic and Health Surveys, which provide a platform for monitoring selected NCDs and their risk factors.

For injuries we conducted the first representative injury mortality study, which described the injury profile and highlighted the importance of interpersonal violence. Monitoring firearm-related deaths nationally and, in the Western Cape in particular, has highlighted the impact of gun control efforts.

Outputs from BODRU have contributed towards identifying the disparities in health status by province and population group as well as strengthening population-based health information systems through surveys. Recent efforts have focussed on hospital information systems, assessing the availability and quality of routine clinical data collected in the public sector.

Policy and Practice

The National Burden of Disease and Comparative Risk Assessment studies identify the burden of disease experienced in the country and provide trend information of modifiable risk factors and estimate the extent of their impact. The projects provide a basis for prioritising research questions and will drive intersectoral response to dealing with major risk factors such as tobacco, alcohol, high blood pressure, physical inactivity and diabetes.

The Rapid Mortality Surveillance provides empirically based indicators of mortality and has been an important tool to monitor the impact of antiretroviral treatment

adherence and the prevention response. It has been particularly important in providing a method to monitor the impact of the maternal and child health interventions.

Our evaluation studies of injury trends have included analyses of death notification data and mortuary-based injury mortality surveillance data. These studies showed the initial impact of the Firearms Control Act in reducing firearm deaths across South Africa from 2000. Subsequently we have shown an association between poor adherence to this Act and an increase in firearm mortality from 2010. We believe that this research has made an important contribution to the renewed focus on firearm control as an effective violence prevention strategy.

In 2006 the Unit's estimates of provincial mortality prompted the Western Cape Government to fund a Burden of Disease Reduction Project over a six-year period. This project consolidated efforts to improve monitoring and surveillance in the province and identified key areas for intersectoral action that included policy changes and structural interventions.

DIGITAL TECHNOLOGIES FOR HEALTH

BODRU embraced the used of mobile phones for data collection, which is an aspect that is becoming a standard aspect of our fieldwork and data collection activities. The Unit also supported the use of tablets in the most recent SA Demographic and Health Survey. Researchers in the Unit have developed an innovative methodology for capturing remote medical records and processing these centrally while adhering to strict ethical guidelines including maintaining confidentiality and strict data security.

One of the tools developed for a National Burden of Disease Study and Comparative Risk Assessment Study was a web-based risk of bias tool, the Burden of Disease Review Manager, which will be used beyond these projects.

The Unit has also engaged in a study that standardises and combines data from two national household surveys to answer current research questions.

The Unit is a designated Collaborating Centre for the WHO Family of International Classifications (WHO-FIC). Our involvement in the WHO-FIC network will guide the application of international coding and data norms and standards in South Africa that will enable the integration of comparable health data across different settings.

Health informatics research done in BODRU has focused on assessing the availability and quality of clinically coded data in public sector hospitals with a view to identifying gaps and areas for improvement towards Universal Health Coverage.

RESEARCH TRANSLATION

The Unit provides comprehensive technical reports on the disease burden profile for each province to use in their medium-term planning and resource allocation. Our annual Rapid Mortality Surveillance report provides a more current perspective to track high level mortality indicators for the country.

As part of our stakeholder engagement we also make regular presentations to a wide range of national, provincial and local stakeholders. These include Parliament, district health committees, research committees, and journalists with an interest in disease profiles, trends and emerging health issues.

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BIOSTATISTICS UNIT

Unit Director: Samuel Manda

OVERVIEW

The Biostatistics Research Unit (BSU) is an interdisciplinary unit with expertise in Biostatistics, Geographical Information Systems (GIS), Data Management and Nutrition and Food Science. These overlapping entities make the Unit truly collaborative and its methodological and application research and services are part of health and biomedical research studies within SAMRC and nationally. By developing and validating novel analytical approaches to myriad of data including health surveys, observational studies and clinical trials the unit has helped in developing more effective and sufficient supporting scientific evidence and solutions for health policy recommendations. These have been instrumental in transforming science and health systems in the country.

The Biostatistics Unit embarked on a digital path with relevant data management elements utilising Redcap which is a secure web application for building and managing online surveys and databases. We supported open access to both our papers and data that we used. We have supported and led on postgraduate training and mentorship in Biostatistics, especially for the marginalized and neglected, which would transform the face of science research by making opportunities fair and equitable.

HEALTH IMPACT

(i) The Unit, through expansive collaboration with other units and external research groups, has contributed to several studies which have had an impact on health systems in the country. The Unit collaborated on both the DREAMS Impact Evaluation study as well as HERStory, which aimed to determine HIV-1 incidence and associated sexual risk behaviours after implementation of DREAMS programmes using household based representative surveys of adolescent girls and young women in four priority districts in the country. The Unit also collaborated on several novel Point of Care diagnostic studies and assessed the impact of these new technologies on linkage to care for HIV positive individuals. The Unit was involved in the antenatal care HIV project which provided evidence on the awareness and knowledge of antenatal care HIV-positive status prior to the current pregnancy, which fell short of the target of 90%. The same project determined South Africa's readiness to transition to programme data based antenatal HIV surveillance with respect to PMTCT uptake, which concluded that South Africa was close to meeting the WHO standard for transitioning to routine RT data for antenatal HIV surveillance.

(ii) It is well acknowledged that Biostatistics remains a scarce skill in the country, with very few PhD level statisticians, and this is particularly among the previously advantaged communities. The Biostatistics Research Unit has supported the SAMRC and the country by putting in place deliberate and pragmatic strategies that created more inclusive scientific research and careers in biostatistics and its application. Our strategies have borne benefits that have been shared fairly and equitably to cover the needs and apprehensions of the marginalized and sometimes excluded groups. In part, several of these scientific activities took place, including:

a) The Unit supported the SAMRC in developing a proposal for a six-year Biostatistics capacity development plan in the country, in collaboration with Hasselt University. This project followed the successful implementation of the BAPED (Building Academic Partnerships for Economic Development), which led to the award of ten scholarships for Masters and PhD degrees in the country. Using our aggressive recruitment

programme, we were able to attract students across all population groups and backgrounds. This process was also repeated when the Unit hosted a first-of-its-kind event in the country, the Biostatistics PhD Symposium which brought together PhD students and revered experts throughout the region.

b) The Unit also hosted a prestigious international conference, the SUSAN-SSACAB 2019, which attracted more than 200 delegates from 27 countries. There was a large proportion of participants from previously disadvantaged universities.

c) The Unit has also complimented its staff with two black females and has taken a leading supervision role on the three PhDs in the Unit. Recognizing that most newly appointed staff are from marginalized and neglected backgrounds, we had embarked on an extensive mentorship programme embedding them in research projects under the supervision of a senior statistician in the Unit.

d) Two female members within the SAFOODS group, who are from the designated groups, are pursuing PhD studies. The group is in addition, mentoring a female NRF intern from the designated group, as part of the NRF capacity building programme.

e) The Health GIS Centre has over the last two decades supported a capacity development programme that has reached over 200 public health technicians, epidemiologists, field workers, surveillance agents, data collectors and data managers regionwide. External organisations receiving regular geospatial mapping and analysis support from the Health GIS Centre over the past decade include the LoveLife Trust, the AIDS Foundation of South Africa, and the Hospice Palliative Care Association, all of whom have gone on through training, mentorship and support received to embrace a spatial aspect to the vision and deployment of their programme implementation, monitoring and analysis.

We believe with these steps taken, our research and innovation would have made decisive contributions for an inclusive and fairly distributed scientific and innovative research environment in biostatistics and the health sciences.

Policy and Practice

During the 2019/20 period, the Biostatistics Research Unit (BSU) has contributed data and statistical analytical approaches to several projects that have provided enough supporting scientific evidence to guide health recommendations and provided solutions to health challenges in South Africa and globally. Some of these projects:

a) The BSU collaborated on a study which informed WHO treatment guidelines for people living with drug resistant TB. This study was a five-year observational study documenting maternal treatment, pregnancy and infant outcomes in pregnant women with DR-TB.

b) In terms of HIV burden in the country, the unit contributed expertise of two co-investigators on the National HIV Prevalence survey (SABSSM) whose design ensured testing for the 90-90-90 indicators which may be calculated at district level. The Unit was involved on the antenatal care HIV project which provided evidence on the awareness and knowledge of antenatal care HIV-positive status prior to the current pregnancy, which fell short of the target of 90%. The Unit is involved in Burden of Diseases and HSRC on the Social Bond projects looking at evidence in HIV among young women from two main surveys. The Unit was greatly involved in the two main South Africa nationally representative health surveys: The first National TB Prevalence Survey that provided evidence on the extent of the TB burden in the country, and the South Africa Demographic Health Survey that provided evidence on several public health concerns such as child health and NCDs.

c) The South African Food Data System (SAFOODS) have concluded a multi-national project funded by USAID, and Feed the Future Nutrition Innovation Lab, which resulted in a capacity building workshop and the development and establishment of a country specific food composition database and tables for Malawi, which will enable nutrition training, practice and research.

d) The Health GIS Centre has participated in or contributed to several studies and initiatives impacting national and regional guidelines and policy guidelines.

DIGITAL TECHNOLOGIES FOR HEALTH

The Biostatistics Unit has embarked on a digital path with relevant data management elements utilising RedCap which is a secure web application for building and managing online surveys and databases. While REDCap can be used to collect virtually any type of data (including 21 CFR Part 11, FISMA, and HIPAA-compliant environments), it is specifically geared to support online or offline data capture for research studies and operations. The REDCap Consortium, a vast support network of collaborators, is composed of thousands of active institutional partners in over one hundred countries who utilise and support

REDCap in various ways. Staff have been trained with the use of this product and this training has been extended to other research units at the SAMRC.

The Unit, with several collaborators in South Africa and the region, have identified several health research challenges facing the country and the region where data science and statistical methods can provide scientific and evidence-based evidence on health policy recommendations and implementation. However, in-depth statistical analyses are being hindered due to lack of analytical skills to handle and analyse Big Data in the Health space. The Unit has put into place initiatives and plans to harness big data. For example, we had already hosted a Big Health Data workshop and some of our staff have attended similar workshops. Two of our staff starting their PhD studies this year, focus on Data Science and Big Health Data.

Research data management and access to this data is an important element of data dissemination. The Biostatistics Unit has established a data repository which is available to students and staff at the SAMRC. The online repository has also been made available to the research community outside the SAMRC. The data portal uses innovative technology that makes it easily discoverable and obtainable for research purposes. The Unit is currently helping to set a digital platform to capture medical and entrance data for 1 Million athletes under the University of Pretoria's Sport, Exercise Medicine and Lifestyle Institute (SEMLI) project. This project concerns itself with sport, exercise medicine and lifestyle interventions for chronic disease.

SAFOODS concluded the re-development of a web based dietary intake assessment tool for use by the larger nutrition fraternity including academia, food industry, research institutions, hospitals and nutritional professionals in private practice.

The Health GIS Centre has contributed extensively towards the development of spatially enabled decision support and surveillance systems across the region and the continent, and the development of extensive capacity in the public health service and research sectors for field-based technologies and methodologies for spatially enabled data collection in HIV/AIDS, tuberculosis, malaria and health systems research.

RESEARCH TRANSLATION

The findings of the National HIV Prevalence Survey as well as the VMMC (Voluntary Medical Male Circumcision) study have been presented at several meetings which included members from the Department of Health and Centers for Disease Control and Prevention. The Report of the Surveys are freely available from the Department of Health and on open access retrieval. Several publications, for instance that have arisen from our research have been published in open access-peer reviewed journals.

"The depth and breadth of biostatistics capacity in the Biostatistics Unit will ensure continued significant roles in designing relevant research questions, studies, statistical methodology and analyses, and interpreting findings. For example, finding supporting scientific evidence regarding the efficacy and safety of the new BCG vaccine, Covid-19 treatment options, and managing depression of HIV mothers. Membership on independent scientific clinical committees allows the Unit to play a critical role in decisions regarding the efficacy and safety of a trial drug, line of treatment, conduct, and continuation of a trial study. The unit is well equipped to support health surveys on topics of increasing major health concern to South Africa, such as Covid-19, tobacco and substance abuse, NCDs, and risk factors, thus providing important population health resources for public health policymakers. Opportunities are bound for the unit to facilitate the analyses of numerous health data generated by emerging innovative health data collection technology."

– Prof Samuel Manda

Updates of the National food composition tables are disseminated to the nutrition fraternity and public at large through our related products and tools, which include Food Composition Tables, the Food Quantity Manual, the Foodfinder programme and SAFOODS website.

Research projects related to the development of both the Foodfinder programme and Malawi food composition database and tables, have been presented at International and National Congresses, while the launch of the Malawian food composition database and tables were disseminated in Malawian print and televised media.

The Health GIS Centre has actively communicated the results of its research studies and technical ventures at national and international conferences and symposia, peer-reviewed journals and in technical reports. The extensive spatial data repository developed for the sub-region over the period of some decades has in the past been disseminated over web-based portals to malaria stakeholders nationally and regionally, and more recently directly with key stakeholders under agreement.

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COCHRANE SOUTH AFRICA

Unit Director: Charles Shey Wiysonge

OVERVIEW

Cochrane South Africa contributes to evidence-informed decision making through synthesising findings from multiple research studies to draw definitive conclusions about what interventions work and ensuring that these findings inform policies and guidelines in South Africa and internationally. The Unit builds the capacity of researchers to do high-quality systematic reviews and the capacity of decision makers to find and use high-quality synthesised research evidence to inform healthcare decision-making in the country and beyond. We host the Pan African Clinical Trials Registry; ensuring that information about planned, ongoing, and completed trials conducted in Africa is in the public domain.

HEALTH IMPACT

Cochrane South Africa has helped to transform the way healthcare decisions are made through summarising the best available evidence generated through research to inform decisions about health care. The Unit promotes evidence-informed health decision-making by producing high-quality, relevant, and accessible systematic reviews and other synthesised research evidence. Systematic reviews have the inherent ability to minimise bias and chance in the assessment of existing research as well as provide a means for policy makers to access all available evidence on key questions in a judicious manner. In addition, systematic reviews lead to identification of areas where evidence is lacking, thereby assisting researchers and research funders to chart methodical paths for future primary research. Cochrane's work is recognised as an international gold standard for high quality trusted information.

A scoping review on school food and nutrition policies prepared in the Unit has led the World Health Organization to commission the Unit to prepare a new systematic review that will inform global guidelines on school food and nutrition. In addition, the Unit contributed evidence to reviews on screening for hypertension and diabetes type 2 for the National Department of Health's policy on early detection and screening for hypertension and diabetes.

Cochrane South Africa has a Cochrane Knowledge Translation Evaluation Support project which involves methodological work to develop theories of change for the general public, health practitioners, policymakers, researchers, and research funders; and an evaluation plan and tools to assess the impact of knowledge translation. The impact of this project will be worldwide, helping Cochrane globally to develop methods for assessing the impact of knowledge translation.

Despite the unparalleled success of immunisation in controlling infectious diseases, vaccination coverage in South Africa is suboptimal. We have applied novel epidemiological analyses to nationally representative population data, to assess the factors associated with low vaccination coverage in South Africa. The analyses show that vaccination coverage varies between and within provinces, and that individual and contextual factors are associated with low vaccination coverage in the country; suggesting that interventions designed to improve vaccination coverage should address people and the communities in which they live.

Ongoing vaccine implementation research projects in the Unit are assessing supply, access, and psychosocial factors associated with vaccination coverage. Our tracking of social media has shown that one-fifth of South African social media users are vaccine hesitant. Vaccine hesitancy refers to the delay in acceptance of vaccination or the refusal of vaccination, despite the availability of vaccination services.

The World Health Organization has identified vaccine hesitancy as one of the greatest threats to global health. We are currently building a programme of work to strengthen capacity in South Africa for conducting vaccine hesitancy research, including qualitative evidence syntheses and primary research.

Our vaccine implementation research work has been taken up by the Academy of Science of South Africa and other national science academies and the World Health Organization in their reports and guidelines on vaccination.

Cochrane South Africa staff collaborate in efforts to clearly communicate findings of systematic reviews in user-friendly ways. In a recent Grading of Recommendations Assessment, Development and Evaluation (GRADE) project, we built on our previous work to develop an approach that improves the clarity of statements to convey research findings. The publication provides guidance and a wording template to formulate user-friendly statements in systematic reviews and other decision tools.

DIGITAL TECHNOLOGIES FOR HEALTH

Our tracking of social media has shown that one-fifth of South African social media users are hesitant towards human papillomavirus (HPV) vaccination. We are currently planning a project to address the determinants of this HPV vaccine hesitancy by providing information on this vaccine using a mobile health application. The use of the mobile health technology will be an innovative way of collecting data, teaching, and training individuals on HPV vaccination.

In this age of digital technologies, people have greater access to health information, but little way of knowing whether that information is accurate and unbiased or not. Cochrane South Africa prepares and disseminates credible information on what works and what doesn't work in health care. This work of providing credible and accessible information to support informed decision-making has never been more important for improving global health.

RESEARCH TRANSLATION

Cochrane South Africa co-hosted the National Non-communicable Disease Symposium with the National Department of Health (Cape Town, March 2020). Unit Staff also attended and presented at the first global Symposium on 'Using Qualitative Evidence to Inform Decisions in the SDG Era: New Frontiers and Innovations' (Brazil, October 2019). The symposium explored the tools and methods needed to support the translation of qualitative evidence into policy and practice, and examined ways of strengthening capacity in this area, particularly in the global South. Stakeholders included scholars, evidence users, evidence brokers, research commissioners and other stakeholders who have produced or used evidence from qualitative research in decision processes across sectors, including education, the environment, health, social development and welfare.

Cochrane South Africa staff have translated research into compelling stories for general audiences through blogs and outlets such as "Think Global Health". Unit staff have also prepared and shared policy briefs with the National Department of Health, on screening for hypertension, and strategies for healthier diets. In an ongoing collaborative project with the World Health Organization Regional Office for Africa, the Unit is elaborating health policy briefs on priority topics to guide actions towards the attainment of universal health coverage and other health related SDGs in Africa. In addition, through this project, Cochrane South Africa has built the capacity of World Health Organization staff on how to conduct and use systematic reviews and other synthesised evidence in decision making.

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HEALTH SYSTEMS RESEARCH UNIT

Unit Director: Catherine Mathews

OVERVIEW

The Health Systems Research Unit (HSRU) is a core intramural research unit of the SAMRC. The Unit conducts health policy and systems research (HPSR) to contribute to national and international evidence-informed health and social policy decision-making and health system sustainability. By strengthening decision-making and health systems we aim to contribute to achieving universal health coverage (UHC) and to improving health throughout the life-course. In planning our research, we consider the importance of the research question within South Africa and globally, as well as the potential contribution of the findings to achieving UHC and implementing the plan for National Health Insurance (NHI) in South Africa. In this way, we ensure our work is relevant – rooted in the South African health system – and timely, but with global relevance and impact. This is in line with the SAMRC's Strategic Goals over the 2019/20 financial period.

HEALTH IMPACT

Our research agenda aligns with South Africa's top 5 causes of mortality and morbidity, especially TB and HIV, and the 2030 National Development Plan. Hence, our work tackles key health issues, including social grants, and testing or costing interventions, particularly for pregnant women, children and adolescents. For example, we have evaluated the effectiveness programmes to prevent vertical HIV transmission on mother and child health, to manage multi-drug resistant TB (MDR-TB), and to prevent HIV incidence among adolescent girls and young women. We have evaluated the impact of social grants on child health and nutrition, and the effectiveness of community health workers. We have described the practice of caesarean sections in public versus private sectors, and we have contributed towards evidence syntheses in all these areas.

We have contributed to a transformed SAMRC and country through the findings and policy recommendations of our research. Additionally, we provided seed funding to early career Black female principal investigators within the Unit to support career development and actively strengthened the capacity of all cadres of staff in our unit. Our unit scientists have added to the pool of African scientists by undertaking postgraduate studies and supervising students in local universities. In 2016, we established a unit-level Transformation Committee which works collaboratively with the SAMRC-wide transformation initiative to contribute towards transforming health care and redressing inequities.

Our research focuses on influencing policies and national programmes in the health and allied social policy sectors. We are currently involved in a large range of national and global initiatives, such as international guideline development groups, Lancet Commission work, WHO and UNICEF initiatives, undertaking studies funded by and with links to the Alliance for Health Policy and Systems Research (an international partnership hosted by WHO), and policy-relevant work with the South African Department of Health and the South African Department of Social Policy. We have influenced policy and practice in a range of areas, as described below.

We participated in a Lancet Commission on 'A future for the world's children?' This involved analysing the current coverage of reporting on SDG indicators for children from 193 countries and contributing to the development of a 'Child flourishing and futures index' which incorporates ecological sustainability into global evaluation of progress in child health. The commission report was launched on 18th February (https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(19)32540-1/fulltext) and unit scientists have been involved in local dissemination focused on the findings related to South Africa (for instance: https://theconversation.com/drastic-action-is-needed-to-ensure-a-better-future-for-south-africas-children-132291).The research for the Commission report shows that South Africa stands out as a unique example of a country that performed poorly across both metrics – child flourishing and sustainability. South Africa ranks 127th in the world for child flourishing measures while being a large emitter of CO2 (ranking 150th out of 180 countries) and unfortunately on track to exceed its 2030 CO2 target by 197%. The elements driving the low flourishing index score include persistently high levels of poverty, food insecurity and lack of access to basic services. On the environmental side, South Africa's high carbon emissions are driven by the heavy reliance on coal for energy and heavy industry. Work done for the Commission suggests that halting further emission increases will require proactive implementation of new policies, allowing for renewable energy sources to contribute to national energy production. Improving the health and wellbeing of children in South Africa today should not come at the expense of eroding the environment for future generations of children.

The work by the scientists in the Unit included the PMTCT Option B+ evaluation; a qualitative evaluation of pre-exposure prophylaxis in six high priority districts; developing a tool to identify adolescents at high risk of HIV infection; developing a package of care for pregnant and lactating school-going adolescents; assessing maternal viral load in Ehlanzeni district; and protocol development to reduce breastmilk transmission of HIV. Scientists in the Unit are part of the national PMTCT Technical working groups, Maternal, Child Women's Health and Nutrition Think Tank, Western Cape HIV Exposed uninfected infant forum, and have contributed to the 2019 national PMTCT policy update.

TB research in the HSRU has focused on a key vulnerable population: those with multidrug-resistant (MDR) TB. MDR-TB is TB which is resistant to the most effective first-line TB drugs and requires treatment with less effective and more toxic drugs. Our work included an observational study of 108 women with MDR TB which found that although low birth weight was reported in more babies exposed to bedaquiline compared to babies not exposed (45% vs 26%; p=0.034), it was not possible to ascribe this effect to bedaquiline exclusively as many drugs are used in combination to treat MDR-TB. Of the 86 children evaluated at 12 months, more babies exposed to bedaquiline were thriving and developing normally compared to babies not exposed (88% vs 82%; p=0.136).These study findings have been presented at the World Health Organization (WHO) and published in Clinical Infectious Diseases. These have also been included in the latest WHO guidelines on managing people with MDR-TB.

HERStory Study: https://www.samrc.ac.za/intramural-research-units/HealthSystems-HERStory. We have recently completed the first phase of an evaluation of the impact on HIV incidence of a South African combination HIV prevention intervention for adolescent girls and young women (AGYW), implemented in schools and communities by government and non-government organisations. The findings enable us to make recommendations on how programming for AGYW can be optimized to reach vulnerable AGYW and to meet their needs. They highlight the need for strengthened HIV prevention programming They can be used to optimize programees to meet AGYW's needs and to address the structural barriers that undermine their sexual and reproductive health.

Scientists in the Unit have conducted work estimating the cost of scaling-up interventions, assessing the affordability of health policy and programmes, providing input on the economic impact of national health policies, and carrying out economic analysis to guide priority setting. Some of the specific areas of focus during the past year include:

- Human resource planning for primary health care – this work was part of the Ministerial Task Team Human Resources for Health Working Group "Needs and Costs" is integrated into the next 5-year Human Resources for Health Strategy and supports the 2030 human resource planning under the NHI
- The Unit undertook an Investment Case, commissioned by the Department of Health, on priority interventions for mental health services, and their costs and benefits

- In relation to contracting of private providers within the NHI, the Unit conducted research into private sector utilization and expenditure patterns. Focusing on normal deliveries and caesarean sections, and drawing on private sector medical schemes data, the study established that the South African private sector has the highest caesarean section rate in the world. These findings led to a case study to understand the health systems drivers for the differences in the rates of caesarean section between the public and private sectors, the challenges these would pose for the NHI, and how they would need to be addressed in the NHI reforms.

We have continued the work of the 'South African Initiative for Systematic Reviews and Rapid Evidence Syntheses on Health Policies and Systems' (SAI). Funded by the Alliance for Health Policy and Systems Research at WHO, SAI undertakes systematic reviews on high priority health systems questions and developed a rapid response service to evidence to decision makers within the South African health system on priority topics for decision making. Some of the rapid response topics addressed include models for non-emergency patient transport; screening approaches to identify multi-morbidity; enhancing TB detection; and optimising community health care workers in primary care.

These rapid responses have a direct policy and practice impact as they are designed to inform processes or decisions that South African service providers are grappling with. In addition, SAI is working on Cochrane systematic reviews on the effectiveness of integrated community case management of childhood illness in LMICs; healthcare workers' perceptions and experience on using mHealth technologies to deliver primary healthcare services; and the impacts of interventions to strengthen routine health information systems.

DIGITAL TECHNOLOGIES FOR HEALTH

Staff from the Unit conducted a project in two sub-districts in the Western Cape Province to explore the use of a mobile health (mHealth) system to strengthen communication between Community Health Workers (CHWs) and primary care facilities (PHCs), with the aim of improving continuity of care, particularly for clients with chronic conditions. The mHealth system focused on requests from facility staff to CHWs to follow up clients in the community who needed to visit the facility. The mHealth system also aimed to expedite referrals by CHWs of people who would benefit from care at a facility. A mixed-method evaluation of this intervention showed that using mHealth for recalls and referrals is probably feasible and can improve communication between CHWs and facility staff. However, our evaluation showed that the success of this kind of intervention depends on health system capacity to incorporate these mHealth strategies.

As noted elsewhere, the Unit has been involved in several Cochrane evidence syntheses on digital technologies for health systems strengthening. These provided evidence for a recent WHO guideline and have influenced policy making in South Africa and other LMICs.

Staff in the Unit have also started using REDCap id data collection. The REDCap is a free and secure web application for building and managing surveys and databases. REDCap allows collection and capturing of data in near real time, which increases our efficiencies in fieldwork management and release of study findings. The Unit has also started the process of curating data from completed surveys. This will allow sharing our data with other researchers and academics.

RESEARCH TRANSLATION

Scientists in the Unit have generated a substantial body of evidence for health systems strengthening in the form of both primary research and evidence syntheses and have been at the forefront of methodological advances for synthesizing evidence, including evidence from qualitative studies and knowledge translation.

We have contributed to international knowledge translation initiatives including the development of health systems guidance by WHO as well as the development of policy briefs for decision-making. We have contributed to national knowledge translation initiatives such as Think Tanks, in which we provide continuous technical support and guidance to policy makers. We have also been involved in writing and contributing to national policies.

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SAMRC/UWC HEALTH SERVICES TO SYSTEMS RESEARCH UNIT

Unit Director: Helen Schneider

OVERVIEW

The strategic purpose of the Health Services to Systems Unit (HSSU) is to strengthen the capacity of health systems to address health priorities through research. This, by generating evidence, and building capacity to generate evidence, on health system strengthening relevant to South Africa's health system, whilst contributing to international knowledge and debates.

During the period under review, the HSSU has focused on a number of core themes, including the strengthening of frontline health systems – from community based to primary health care (PHC) and district health systems (DHS); and on governance and accountability of health systems at macro, meso and micro levels. These themes are of major relevance to the health system strengthening and future reforms such as National Health Insurance in South Africa.

HEALTH IMPACT

Tackling governance failures is widely recognised as central priority in strengthening South Africa's health system. In 2019/20, we advanced our research health system governance, with a focus on provincial and district health systems and from several angles.

During the period under review, the Unit showed that:

i. governance innovations add significant value to district health system strengthening for improved maternal and child health outcomes;
ii. intersectoral governance for the First Thousand Days Initiative may never get out of the starting blocks when actors have divergent views of the problem, let alone the solution;
iii. strengthening district accountability for health outcomes cannot be reduced to yet another centrally designed audit, performance or accountability tool, resulting in bureaucratic compliance and little else;
iv. local systems of collaborative governance are key to tackling complex health problems.

Through this research we showed the crucial importance and mechanisms of a bottom up health system strengthening agenda to complement top down legislative and other reforms.

The above areas of research are being driven by doctoral and post-doctoral candidates who form part of a large, diverse and increasingly popular doctoral programme at the UWC SOPH, with currently 50 students, convened by the Unit Director.

The HSSU is playing an important role in strengthening capability for health system and policy research in the SAMRC. In 2019, the Unit Director chaired the Scientific Committee of the successful first National Dialogue on Universal Health Coverage, hosted jointly by the SAMRC and National Department of Health. The meeting brought together more than 140 researchers and policy makers on the theme of UHC in South Africa.

Research on district health system governance for health outcomes has influenced thinking and programming in the National Department of Health and has also been recognised globally by groups such as the WHO Health Systems Governance Collaborative, of which the Unit Director is a member.

Also, the Unit Director led a research prioritisation exercise for universal health coverage (UHC) in South Africa under the auspices of the SAMRC. This involved an initial workshop of 25 health systems researchers, who drew on existing diagnostic exercises and health system frameworks to formulate a list of research priorities. These were then converted into an online survey, posted on a listserv of Public Health Association of South Africa and completed by 68 respondents. The report of this survey has been shared widely and forwarded to the National Health Research Council. It shows very well the comprehensive research agenda required to advance UHC in South Africa.

The research of the HSSU on district health system strengthening for improved health outcomes, much of which was disseminated during the course of 2019/20, has positioned the Unit well to advance our conceptual and methodological approaches, which are now being implemented in a new generation of evaluations of district and provincial initiatives. One of these is the Mphatlalatsane Project, a large, three-province project of the National Department of Health aimed at reducing maternal and neonatal mortality through quality improvement approaches. In collaboration with the Health Systems Research Unit (HSSU), the HSSU will be evaluating the project. We are also in the process of developing a proposal for the prospective evaluation of a health system strengthening initiative to reduce maternal mortality in the Free State Province.

DIGITAL TECHNOLOGIES FOR HEALTH & RESEARCH TRANSLATION

The HSSU focuses on the people behind the technology, rather than the technology itself, showing how technological innovations become integrated into the everyday routines complex, adaptive and social systems a psychophysiological "lab", where data on emotional expressiveness and facial emotion recognition from outpatients with varying degrees of childhood maltreatment will be collected.

In 2019/20 our research translation strategies included:

i. Active participation in a joint journal club with senior Western Cape Government health managers, which meets 6-weekly on strategic health systems themes (through CHESAI – Collaboration for Health System Innovation and Analysis between UCT and UWC)

ii. An article in The Conversation

iii. Dissemination workshops with stakeholders at district level

iv. Participation in strategic national (UHC Dialogue, NHI consultation) and provincial (Western Cape, Free State) processes

v. International webinar hosted by: The Collectivity Community Health Community of Practice where the Unit Director made a presentation entitled: The design and governance of national CHW programmes: a 'best fit' vs 'best practice' agenda

vi. Publications in open-access, peer reviewed journals

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District health systems and primary health care are the most decentralised building blocks of South Africa's public health system. Their functioning is critical to the attainment of universal health coverage (UHC), and will be a key component of future reforms in South Africa, such as National Health Insurance (NHI). Strengthening governance is recognised as a central priority in South Africa's health system, and is an ongoing focus of our work. We have shown how local health system governance innovations add significant value to health system strengthening for improved health outcomes, the importance of local forms of collaborative governance for tackling complex problems, and how strengthening local accountability involves far more than an audit, performance or accountability tool. Through this research we continue to show the crucial importance and mechanisms of a bottom up health system strengthening agenda to complement top down legislative and other reforms such as NHI. – ***Prof Helen Schneider***

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. SAMRC/UCT Drug Discovery and Development Research Unit
2. Primate Unit and Delft Animal Centre
3. The Biomedical Research and Innovation Platform
4. SAMRC/TUT Herbal Drugs Research Unit

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

SAMRC/UCT DRUG DISCOVERY AND DEVELOPMENT RESEARCH UNIT

Unit Director: Kelly Chibale

OVERVIEW

The Drug Discovery Research Unit (DDRU)'s work is specifically focused on translating basic science knowledge into potential innovative new medicines to treat malaria, tuberculosis and antibiotic-resistant microbes in efforts to combat antimicrobial resistance.

The inter-disciplinary drug discovery research undertaken in the Unit involves the integration of multiple disciplines, from basic to clinical sciences. It is positioned to contribute directly to health innovation, defined as the delivery of tangible outcomes useful to the improvement of health.

The work of the Unit advances the mission of the SAMRC to improve the health of South Africans and contribute to the development of the South African bioeconomy while also at the same time further developing the established drug discovery infrastructure and capacity.

HEALTH IMPACT

The Unit is the first and only one of its kind in South Africa and Africa whose work is focused on harnessing modern innovative pharmaceutical industry skills and expertise in the drug discovery value chain – integrating medicinal chemistry, biology, pharmacology as well as drug metabolism and pharmacokinetics studies.

Together this has been creating a critical mass of South African scientists with the capabilities of developing clinical drug candidates, with a unique focus on the diseases afflicting South Africa. It plays a critical key role in building capacity and competency in the relevant areas of drug discovery and has been uniquely positioned to overcome the historical (South African) challenge of translating basic science knowledge into life-saving medicines.

The establishment of a state-of-the art drug discovery unit has the potential to lead to seeding an innovative pharmaceutical industry that will not only seek to address the challenges of infectious and non-infectious diseases that are endemic to South Africa, and for which there is a paucity of effective drugs, but also contribute to job creation.

PhD student, Stephanie Kamunya, from Prof Kelly Chibale's SAMRC Drug Discovery Extramural Unit synthesizing novel drug-like anti-malarial compounds

H3D Investigator, Dr Jean Dam, working as a medicinal chemist on drug discovery lead optimization programme co-funded by the SAMRC and Medicines for Malaria Venture

Policy and Practice

The Unit's work has led to the identification of quality leads suitable for optimisation and candidate selection as potential agents for the treatment of uncomplicated Plasmodium falciparum malaria, with the potential to also contribute to malaria eradication.

On the other hand, the Unit's work has also led to the identification of quality leads suitable for optimisation and candidate selection as potential agents for the treatment of tuberculosis caused by replicating and non-replicating forms of Mycobacterium tuberculosis with activity against Multi-Drug Resistant forms of the disease and potential to contribute to new treatment shortening regimens.

Towards addressing global health inequalities, our Unit is focused on developing technology platforms that allow customization of medicines to African patients' needs and discovering medicines for diseases that predominantly affect African populations, such as malaria, tuberculosis and antibiotic-resistant microbial diseases. Our Unit is a place where African scientists utilize their scientific skills and education to improve the health of African patients and to educate the next generation of African pharmaceutical scientists.

– Prof Kelly Chibale

DIGITAL TECHNOLOGIES FOR HEALTH

The Unit's research in the discovery and development of potential new medicines will benefit immensely from the application of Artificial Intelligence (AI). This is because technologies that will incorporate AI will become versatile tools for application at various stages of the drug discovery and development value chain.

The aforementioned stages include the identification and validation of drug targets in the disease-causing organism, design and synthesis of new drugs, use of drugs developed for one disease in another disease (drug repurposing), improving the R&D efficiency, aggregating and analysing biomedicine information and refining the decision-making process to recruit patients for clinical trials.

These potential uses of AI will provide the opportunity to counter the inefficiencies and uncertainties that arise in the classical drug development methods while minimising bias and human intervention in the process.

The implementation of AI in the discovery of small molecule drugs concerns the utilisation of chemical space, which facilitates the identification of novel and high-quality molecules due to the possibility of computationally enumerating the probable molecules. Additionally, machine learning techniques and predictive model software will also increasingly contribute to the identification of target-specific virtual molecules and association of the molecules with their respective biological target while optimising the safety and efficacy profiles.

RESEARCH TRANSLATION

The Unit Director regularly engages with the public through various media. Achievements have received coverage in online, print (national and international), including the Financial Times, which featured the Unit Director four times in 2019 alone, television (including the British Broadcasting Corporation that featured the Unit Director and the Unit's work in 2019), and radio channels.

As part of its Grow Our Own Timber (GOOT) programme, the Unit regularly hosts school learners for job shadowing. In addition, jointly organizes and co-hosts events with the Students' Health and Welfare Centres Organisation (SHAWCO) based at the University of Cape Town. These events are educational for both SHAWCO and the Unit scientists. Typically, SHAWCO Health provides an overview and opportunities for the Unit scientists to experience typical TB patient healthcare scenarios and the challenges of caring for patients in the South African context.

On the other hand, the Unit provides SHAWCO Health with an opportunity to learn about the typical drug discovery process. This is done because scientists working at the early stages of the drug discovery process often lack direct contact with the patients for whom the compounds are being developed and can therefore feel disconnected from the bigger picture of their work.

Similarly, those working at the coalface of healthcare, such as medical students who volunteer for SHAWCO Health, may have little idea of what it takes to bring a new medicine from the lab to the shelf (or from the bench to the bedside).

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PRIMATE UNIT AND DELFT ANIMAL CENTRE

Unit Director: Chesa Chauke

OVERVIEW

Primate Unit and Delft Animal Centre (PUDAC), a registered South African Veterinary Council (SAVC) Research Platform, is a subdivision of the Grants, Innovation and Product Development (GIPD) Directorate of the SAMRC. PUDAC provides a facilitating platform with reference to the supply of animal models, animal housing and research infrastructure for the purpose of biomedical research. All animal models are maintained according to a set of ethical standards as prescribed in the national policies on the care and use of research animals. The primary mission of the platform is to engage in basic and applied collaborative contract research in association with academia and industry, conduct pre-clinical and translational research, support research and vaccine development, and provide animal resources and services.

Goals and strategic objectives areas:

Goal 1: Enhance the generation of revenue by improving services, collaborations and outputs.

Goal 2: Facilitate biomedical research through the provision of appropriate infrastructure, animal models and research support.

Goal 3: Generate new knowledge and innovation in the field of reproduction, non-communicable and infectious diseases.

Goal 4: Capacity Development and Transformation.

HEALTH IMPACT

With research support and the supply of the appropriate animal models, PUDAC has made a huge contribution to the outcome of various research projects over the years. This enabled the Unit to refine its' non-human primate models to the extent for use in novel research that may contribute to finding new strategies to curb human disease. The animal facility was established in the early 80s with the main purpose of providing animal models and technical support to internal and external research units and scientists. Since then, PUDAC instigated essential transformation to the core business function and evolved to a research facility more focused on the participation and development of specific research fields parallel to the core values/objectives of the SAMRC. These include the following research programmes: non-communicable diseases (NCDs), HIV research and reproductive biology.

Current research efforts at PUDAC are aimed at using NHP models to contribute to combat the burden of NCDs affecting South Africans and to bridge the gap in HIV vaccine research in an attempt to accelerate the pace of HIV vaccine development in the country. PUDAC established SHIV/Chinese Rhesus monkey model is an important achievement in SAMRC's efforts in accelerating HIV vaccine progression from the bench to phase 1 clinical testing in humans.

(i) PUDAC serves on the SABS Board on the revision of national policies and guidelines on the care and use of animal models with specific reference to NHP. The findings from recent inhouse publications on topics such as housing strategies, zoonotic disease, stress and stereotypical behaviour contributed significantly to the compilation of the revised SANS document.

(ii)To support HIV vaccine development in South Africa, PUDAC established a SHIV/Chinese Rhesus monkey model for testing the efficacy of candidate HIV vaccines. This model can be used for HIV cure research as well as studies on HIV co-infection with other tropical infectious diseases such as TB and malaria which are highly relevant medical problems in South Africa. In addition to studies conducted at PUDAC in diabetic obese mouse and rat modes, the development of NCD NHP models (hypertension, obesity and diabetes) are playing a major role in influencing further research in the development of biomarkers to characterize and to track disease progression.

DIGITAL TECHNOLOGIES FOR HEALTH

PUDACs contribution to 4IR is through precision medicine, whereby most of our NCD studies take into account the individual disease dynamics by screening for relevant disease mutations using Sanger sequencing and bioinformatics which combines biology, computer science, information engineering, mathematics and statistics to analyse and interpret the biological data. Since individuals respond differently to drugs, knowing their genetic make-up before administering treatment is important especially since we are using specialised animal models. This approach assists us in determining the exact dose and the expected treatment response for each individual. By using big data analysis such as next-generation sequencing, the aim is to identify biomarkers and estimate individual risk for diseases such as obesity, hypertension and geriatric diseases (Alzheimer's).

Animal testing is in the era of the 3Rs, which means replacing, reducing, and refining alternatives. The Reproductive Laboratory in collaboration with UWC has implemented various new techniques on sperm biology and function through training and workshops. These analyses are supported using a software programme (CASA), an improved digital innovation to the field of spermatology. Training and use of this programme to investigate sperm contribute to the field of artificial insemination (ART), ICSI (intracytoplasmic sperm injection) and Andrology.

Furthermore, the establishment of the SHIV/Rhesus monkey model offers an opportunity to create a unique technological research platform that potentially enhances the competitive edge of South Africa globally, not just in the HIV research field but also in other medical fields such as testing of medical discoveries/devices.

RESEARCH TRANSLATION

As part of the capacity development initiative which is in line with the SAMRC's strategic goals, PUDAC staff and students and/interns attended both local and international conferences thereby sharing their laboratory findings with relevant stakeholders. This networking created collaboration opportunities for the platform, which will increase our research outputs. Peer-reviewed publications is another form of PUDAC's research translation. In addition, PUDAC engages with relevant local and international stakeholders through meetings/workshops and facility visits to share research ideas and forge collaborations.

Recent PUDAC research translation activities:

- UWC Regional Animal Housing Facility.
- NHREC annual meeting, Department of Health.
- Animal Research Ethics Committee (AREC) Training Workshop.
- UKZN Postgraduate Research & Innovation Symposium conference.
- Early Career Scientist 2019 Conference.
- Physiology Society of Southern Africa conference.
- Academy of Pharmaceutical Sciences conference.
- UWC research symposium conference.
- Ethics Workshop (UCT & SAMRC).
- South African Association for Laboratory Animal Science (SAALAS) Workshop.
- Keystone Symposium on Functional Cures and Eradication of HIV (X8-2019) conference.
- Mauritius visit/collaboration with LCL-Cynologics.

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BIOMEDICAL RESEARCH AND INNOVATION PLATFORM

Unit Director: Johan Louw

OVERVIEW

Research at the Biomedical Research and Innovation Platform (BRIP) is aligned with all four strategic goals set out by the SAMRC's 2019/2020 Annual Performance Plan. The Platform is committed to lead the generation of new knowledge in the field of non-communicable diseases (NCDs) research and translate this research into practise by publishing in high impact, ISI-rated journals. Under this theme, BRIP disseminated and published more than 35 peer-reviewed scientific publications and five book chapters. For this fiscal year, BRIP has secured research funding in excess of R6 million and has attained a clean financial audit for the 2018/2019 financial year. In the innovation space, BRIP has filed a local patent submission for a new heart failure marker, whilst the development of markers for the early detection of diabetes continues. Additionally, BRIP has established local and international industrial partnerships to develop novel health products. These partnerships allow for collaborations with under-resourced institutions aimed at building young black scientific leadership for South Africa.

HEALTH IMPACT

The Biomedical Research and Innovation Platform's key research area is aligned with the SAMRC's vision "Building a healthy nation through research and innovation". The Platform's research focuses on metabolic health challenges that are pertinent to South Africa, such as obesity, diabetes, gestational diabetes, hypertension and cardiovascular dysfunction. Research at the Platform identified epigenetic mechanisms as potential biomarkers for gestational diabetes in a black African population in Gauteng. Approximately 9 - 26% of pregnant women in South Africa develop gestational diabetes. Thus, biomarkers could serve to facilitate intervention strategies in high risk women to prevent the development of gestational diabetes and future metabolic complications for them and their offspring. In addition, work done on uncontrolled hypertension in the Mthatha area of the Eastern Cape showed that 75% of individuals treated for hypertension remained uncontrolled. The research uses a multidisciplinary approach to identify genetic variants that may facilitate better management of patients with

uncontrolled hypertension. The Platform also reported on adverse drug reactions caused by herbal medicines, which is becoming a serious health concern. The potential of herbal immune boosters to interfere with oestrogen metabolism, highlighted the likelihood for oral contraception failure when consuming such products. Herb-drug interactions were also demonstrated for other chronic medications such as statins, a class of drug used to lower cholesterol. To investigate adverse drug interactions, BRIP has developed a physiologically relevant three-dimensional tissue culture system that improves metabolic and toxicological prediction of herb-drug or drug-drug interactions without the use of animals.

As set out by the National Development Plan, "By 2030, 75% of academic staff should have PhDs and of these, women and black people should make up more than 50% of research and training staff". During this fiscal year, BRIP's capacity development programme trained 26 black M.Sc. and Ph.D. students, of which 70% were female. The postgraduate programme included students from four under-resourced institutions, including University of Zululand, University of Limpopo, University of Western Cape and Walter Sisulu University. In addition, two black female graduates, developed by this capacity development programme, were appointed as an Associate Professor at University of the North West and as a Senior Lecturer at University of Zululand.

As part of the SAMRC's strategic transformation programme, students from under-resourced universities were invited to participate in the 4th Annual Joint Biomedical Research Conference held in Durban on the 25th – 27th July 2019. Moreover, to bring advanced scientific skills to the Platform, a Specialist Scientist (Dr Dludla) is continuing with his research fellowship in Italy. This research fellowship has already yielded 12 peer reviewed publications during this reporting period. Additionally, Dr Pheiffer spent three months at the Vall d´Hebron Research Institute in Barcelona, Spain as part of the "Science by Women" programme, whilst Dr Johnson was invited to present at the University Hospital Fundación Jiménez Díaz, Madrid on 23 September 2019 on early biomarkers for diabetes induced cardiovascular dysfunction.

In collaboration with national and international industrial partners, BRIP is developing novel therapeutics to treat metabolic diseases. These partners include BioPharm NZ Ltd. and Afriplex (Pty) Ltd. BRIP has also partnered with the UK-based High Force Research (HFR) Ltd. to develop an upscaled method for the synthesis of aspalathin, the major bioactive compound found in rooibos. The technology developed by HFR will be transferred to a South African chemical company.

DIGITAL TECHNOLOGIES FOR HEALTH

Rapid advances in digital technology has transformed the way in which BRIP is communicating with stakeholders and collaborators. BRIP is using digital platforms to build a strong brand that can create a unique perception of its competencies. The Platform uses Microsoft Teams as an effective communication tool to exchange scientific strategies with other scientists and collaborators in Spain, Belgium, Denmark, Taiwan, Japan, and Italy. Data generated through these collaborative partnerships are

stored either on SharePoint or REDCap as Microsoft Teams permits BRIP and its virtual partners access to the secure web application from anywhere in the world.

To promote responsible and ethical research, BRIP has developed a three-dimensional cell culture model that produces human liver spheroids which closely mimic liver physiology and function. The model offers the potential to investigate cellular responses to drugs and herbal products in real-time. This technology allows for the in vitro detection of potentially toxic drug breakdown products that predict liver toxicity, thus reducing the use of laboratory animals.

RESEARCH TRANSLATION

Publications: In this fiscal year BRIP has published more than 35 scientific publications. To increase BRIP's visibility, marketability and H-index of scientists, one third of these publications were published in open access format at a cost of R340 000, incurred by BRIP.

Media communication: BRIP participated in the South African Rooibos Council's, Rooibos Science Café held on 2 April 2019. In the wake of the International Day of Women and Girls in Science, the South African Rooibos Council acknowledged the Platform's female scientists for their research on the health properties of rooibos. This event included live telephonic interviews and media releases on various digital platforms. BRIP actively promoted mathematics and science in numerous community outreach/career EXPOs at schools around Cape Town, including schools within disadvantaged communities.

Furthermore, the Platform has an ongoing commitment to promote science through its job shadowing programme offered to young, aspirant learners at its laboratories.

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The future of science has drastically changed with the advent of COVID-19, necessitating multidisciplinary collaboration and scientific resilience integrating technology such as interpreting big data using artificial intelligence (AI). Biomedical Research and Innovation Platform (BRIP) intends to use AI and develop a national and global footprint by performing research that is current and impactful. In the next 5 years, BRIPs will expand its national and global partnerships with a shared vision of advancing health through scientific excellence. BRIP is committed to be at the forefront of innovation and advancements in precision medicine related to obesity, diabetes, and its associated cardiovascular health risks. BRIP will continue to develop talent and work as a team towards a shared goal and with this commitment, they will train the next generation of scientific pioneers that can perform impactful research, which will make a difference to the health of the man on the street.

– Rabia Johnson

BRIP team, engaging with learners and encouraging careers in science

SAMRC/TUT HERBAL DRUGS RESEARCH UNIT

Unit Director: Alvaro Viljoen

OVERVIEW

Herbal medicine and most notably, African Traditional Medicines, have not been officially recognised in most countries, despite the continued use of medicinal plants over many centuries and an upsurge in the popularity and use of these natural resources throughout the last decade.

Consequently, education, training and research in this area have not been rendered due attention and support. The quantity and quality of the safety and efficacy data on phytomedicines are far from sufficient to meet the criteria needed to support their use worldwide. This lack of research data can be attributed partly to the fact that health care policies have neglected to adequately address phytomedicines.

However, the absence of appropriate or accepted research methodology for evaluating traditional and herbal medicines remains the biggest stumbling block to the commercial development of phytomedicines.

Despite the continued use of medicinal plants over many centuries in our biodiverse country, herbal medicines (including traditional medicines) have not been officially recognised. Consequently, education, training and research in this area has not been rendered due attention and support. The quality, safety and efficacy data on phytomedicines are far from sufficient to meet the criteria needed to support their use locally and globally. Any medicine, including herbal medicine, needs to adhere to the cardinal rules of quality, safety and efficacy (QSE). The SAMRC Unit in Herbal Medicines continues to support the development of the industry in South Africa with research on the QSE of traditional medicines and modern phytomedicines. The work completed by the unit to profile the most important traditional medicines and develop a comprehensive herbal pharmacopeia fills a much needed and urgent void. This work will be of benefit to members of the public (consumers/patients), the regulator (SAHPRA) as well as the nascent industry in general.

– Prof Alvaro Viljoen

HEALTH IMPACT

Since November 2013, all herbal medicinal products packaged as a pharmaceutical dosage form (tablets, capsules etc.) or marketed as natural health products (NHP), became subject to regulation by the South African Health Products Regulatory Authority (SAHPRA), formerly known as the Medicines Control Council (MCC). African Traditional Medicines will for now not be regulated, but it is envisaged that those that are available in pharmaceutical dosage forms will also soon face regulation. The success of any herbal medicine hinges on three crucial aspects, namely quality, safety and efficacy (QSE). It is only when these three components are confirmed that consumer trust and confidence are ensured.

The Unit is committed to support the development of the industry in South Africa with research on the QSE of new and established products. Such research will be of benefit to members of the public (consumers), the regulator (SAHPRA), as well as the nascent industry in general. Broadly, the Unit builds capacity, increases research outputs and trains postgraduate students. It is also important to note that the Unit is involved in research translation to both the regulator and industry, and acts as technical support for both.

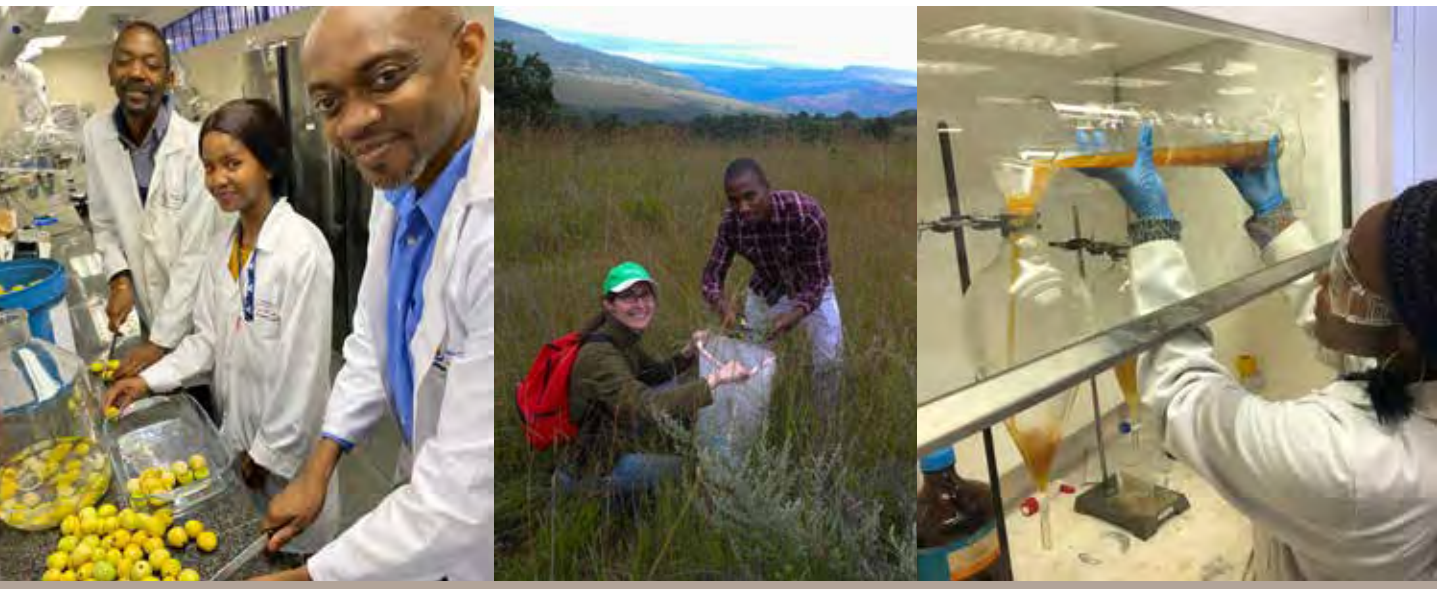
The SAMRC's vision is to "build a healthy nation through research", and the Unit's work supports this vision in this under-researched area. Apart from translational research into policy and practice, the Unit aims to create intellectual property (IP), which may form the basis for new products, thereby adding value to South Africa's biological resources.

Policy and Practice

The research completed in the Unit straddles various aspects of Herbal Drugs which by definition is a multidisciplinary field. The main focus is to perform both basic and applied research to address aspects relating to the quality, safety and efficacy of herbal medicines. Although focus is placed on African traditional medicines, the scope is broadened to also include internationally imported botanicals used in the preparation of phytomedicines. This approach is aimed at increasing the global exposure and relevance of the Unit.

Academic impact

The primary objective remains the training of postgraduate students and developing human capital. The Unit managed to attract and train a large cohort of postgraduate students.



Members of the SAMRC Herbal Drugs Research Unit have worked towards the completion of a Herbal Pharmacopeia which involves an intricate workflow; collecting of botanical specimens, extraction of the phytoconstituents, analytical profiling of the herbal material, recording the pharmacological activity and potential toxicity of the herbal extracts. This work has culminated in the completion of various herbal monographs for several of the traditional medicines used in South Africa.

Currently the Unit is a research incubator accommodating 26 postgraduate students whose projects are directly related to the aims and objectives of the Unit. Almost all students have managed to publish work emanating from their postgraduate studies and the research has been widely presented at national and international meetings. The students have managed to secure several awards and prizes during the completion of their studies. Judging by the citations and downloads statistics the completed research enjoys local and international recognition.

Contribution to society:

The herbal medicines industry delivers products fortified with extracts of natural origin that are known to have beneficial active ingredients. Despite the common belief that phytocompounds are safe, they pose the same inherent risks as synthetic xenobiotics. Not surprisingly, associations between the consumption of herbal products and instances of toxicity have been made. Although the adverse effects of phytotherapeutic medicines are recorded less frequently compared to synthetic drugs, such effects have been reported. A serious and valid concern to regulators, health professionals and users is that most herbal medicines are sold as food supplements, therefore circumventing regulations regarding their quality, safety and efficacy (QSE).

The Unit has developed validated analytical methods for robust quality control of medicinal plants: This aspect represents the very core of the research focus of the Unit. Important quality control studies have been completed on various medicinal plant species indigenous to South Africa. In line with establishing quality standards for some of the commonly used herbal medicines in South Africa, we have drafted several monographs that include a comprehensive summary of the botany, phytochemistry, uses, pharmacology, safety and toxicity of these herbal materials. The analytical methods included in the monographs were developed to assist in the quality assessment of traditional medicines.

DIGITAL TECHNOLOGIES FOR HEALTH AND RESEARCH TRANSLATION

The Herbal Drugs Research Unit uses modern technology to add substantial value to assist in developing some of South Africa's botanical assets into commercial products. In this way, the Unit may be instrumental in unlocking and advancing the possible socio-economic value of our indigenous resources to the benefit of all South Africans.

The main aim of the Unit is to conduct technologically advanced scientific research, and to make basic knowledge readily available to stakeholders, in order to promote the quality, safety and efficacy (QSE) of herbal medicines.

The Unit has been developing comprehensive species monographs containing important technical information which will be compiled into a Pharmacopeia. This Pharmacopeia will guide future best practice in the quality assessment of herbal raw materials and formulated products.

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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. SAMRC/SANBI/UWC Bioinformatics Capacity Development Research Unit
2. SAMRC/UCT Immunology of Infectious Diseases Research Unit
3. SAMRC/UP Stem Cell Research and Therapy Unit
4. SAMRC/ WITS Antiviral Gene Therapy Research Unit
5. SAMRC/NICD Antibody Immunity Research Unit
6. SAMRC/CPUT Cardiometabolic Health Research Unit
7. SAMRC/SU Genomics of Brain Disorders Research Unit
8. SAMRC/UP Precision Prevention and Novel Drug Targets for HIV-Associated Cancers
9. SAMRC/UCT Wound and Keloid Scarring Translational Research Unit

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

SAMRC/SANBI/UWC BIOINFORMATICS CAPACITY DEVELOPMENT RESEARCH UNIT

Unit Director: Alan Christoffels

OVERVIEW

Bioinformatics is a discipline straddling the fields of biology, mathematics and computer science and is integral to biomedical research. The SAMRC/UWC Bioinformatics Unit is part of the South African National Bioinformatics Institute based at the University of the Western Cape. Our mandate is to train the next generation computational biology scientist in South Africa, and we do so alongside research and development projects in collaboration with researchers nationally and globally.

The Unit develops open-source analytical methods in response to biomedical data management, usage and interpretation. In this regard our R&D focuses on:

i. methods for moving analyses to the data using local clouds,
ii. reproducible analytical methods for analysing high throughput sequencing data,
iii. archiving data and
iv. pathogen surveillance.

Our strategic collaborative partners include the Africa Centers for Disease and Control as we transform the pathogen surveillance capacity at public health institutes on the African continent.

HEALTH IMPACT

i. Research

Pathogen sequencing enables a rapid response to public health emergencies including insights into transmission dynamics and disease progression. Pertinent to this eco-system is the need for reproducible analytics and standardized protocols for data storage and access to pathogen biological specimens. At the Unit, we have been working on different elements of pathogen surveillance including data storage (COMBAT-TB-NeoDB), workbench (COMBAT-TB; www.combattb.org), visualisation (COMBAT-TB-Explorer), and biospecimen tracking (Baobab LIMS; www.baobablims.org). These tools have been used by researchers in the country.

Between 2008 and 2010 outbreaks were reported in all nine provinces with 232 confirmed infections in humans, and 26 confirmed deaths. The Unit is investigating the epidemiological history of Rift Valley Fever Virus circulating in South Africa and in other African countries. The results of this study have the potential to inform governmental policy aimed at restricting the movements of infected livestock across national borders with impact on human health.

ii. Innovative public engagement

The SAMRC/UWC Bioinformatics Unit has developed a public engagement tool (Speaking book on Biobanking) to communicate the importance of biomedical research and biobanking to the public. The results of this intervention show significant improvement in knowledge acquisition by the public and an interest in donating biospecimens for future biomedical research; this tool is poised for roll out at clinics and public libraries.

Policy and Practice

i. Practice Globally

We have developed a graph database as a move away from traditional relational databases for storing pathogen data. Impact of this new approach can be seen by (a) invitation to 30 global players in this field to share their approach at a meeting in Berlin (https://neo4j.com/blog/neo4j-life-sciences-healthcare-workshop-berlin/), and (b) our approach is being used by international teams redesigning their disease vector databases and a global users network interacting with our COMBAT-TB platform (114 views and 77 users of our COMBAT-TB system distributed across China (14 users), SA (13), Japan (10), USA (6), Belgium (5), Italy (5), Germany (3), India (3), Argentina (2) and Canada (2)).

ii. Influenced further research

Biobank informatics is a growing area of research. Our biospecimen tracking open-source software has further expanded with global partners through the following partnerships namely:

i. Abidjan Biobank – funded through the West African Health Organisation, the Baobab LIMS is being customized and translated to French for the Cote d'Ivoire biobank.

ii. Lagos Biobank – the Health Ministry in Lagos has funded the implementation of Baobab LIMS in the Lagos Biobank with customized features.

iii. USA CDC – As of January 2020, Baobab LIMS will be a key component of the CDC's opensource platform to manage biospecimens and data.

DIGITAL TECHNOLOGIES FOR HEALTH

We continue to build prototypes for data archiving and data management using open-source tools. We have developed a prototype of what an African Genomics Archive could look like. This very recent prototype is being submitted for publication and forms the foundation for expanded development to ensure long term storage and access to pathogen data on the African continent (https://github.com/jamietyger/AfricanGenomeArchive).

Our open-source integrated platform for tuberculosis omics data (www.combattb.org) includes components from international open-source projects such as the Integrated Rapid Infectious Diseases Project (www.irida.ca) in Canada. Our platform ensures that mycobacterial sequencing data is captured, archived and analyzed with reproducible tools. This platform allows further development in the international scientific community.

The information technologies implemented and developed in our omics platforms provide parts of a larger eco-system to support health. None of these represent hand-held devices.

The World Health Organization (Africa Office) recently announced that the SAMRC/SANBI Bioinformatics Unit will be one of three regional reference laboratories to respond to pandemics and emerging infectious diseases. This sums up our strategic direction for the next few years namely to expand the analytics ability of African teams to analyze pathogen genomic data to inform country-level and regional-level health interventions. One of the drivers of this plan is to consider generalized systems that can be agile to rapidly respond to disease outbreaks. Not to forget the central role of public engagement.

– Prof Alan Christoffels

RESEARCH TRANSLATION

The Unit relies on two communication media to reach our stakeholders:

i. The HIV drug resistance testing software

The software developed in the Bioinformatics Unit is now being rolled out worldwide as a partnership between Hyrax Biosciences (a company spun-out by Simon Travers) and Thermo Fisher Scientific. Any users who purchase Thermo Fisher's low-cost HIV drug resistance (HIVDR) testing kit are provided with free access to the software for the analysis and interpretation of the data generated by the kit. Access to a low-cost, scalable, end-to-end HIVDR solution is an exciting development in the global fight against HIV and we are very proud that part of this solution was developed at SANBI. 2019 saw many national labs from Africa, Asia, Central and North America sign up to use the service. Further, 2019 saw the expansion of the software to enable TB drug susceptibility testing – this will also be rolled out globally through Hyrax Biosciences

ii. Public engagement tool

We have developed, and tested in the field, a speaking book "Biobanking and Me" that is available in English-Xhosa, and English-Afrikaans). The physical books were produced as a proof of concept and will require additional resources for a national roll out. We have made these also available electronically on YouTube:

English:
https://www.youtube.com/watch?v=5LMG4ExqlU4,

Afrikaans:
https://www.youtube.com/watch?v=n8aoTkRtQ44,

Xhosa:
https://www.youtube.com/watch?v=H-r_DRYfhO8

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IMMUNOLOGY OF INFECTIOUS DISEASES RESEARCH UNIT

Unit Director: Frank Brombacher

OVERVIEW

The objectives of the Immunology and Infectious Diseases Research Unit are basic and clinical research in immunology and infectious diseases by studying their similarities and the factors influencing immunity to disease.

Infectious diseases - like Tuberculosis (TB), African Trypanosomiasis, Leishmaniasis and Bilharziosis - are leading causes of death in many parts of the world and have a devastating impact on disadvantaged communities in the African (and South African) population as well as on the economy.

Some of the key focus areas include:

i. Discovering ways to identify the genes and bacteria involved in both immunity and infection;
ii. Developing vaccines for infectious diseases in Africa;
iii. Producing effective and affordable treatments; and
iv. Embracing a wide range of research methods to build capacity and training in infectious disease research.

Over and above that, the Unit is involved in student development to principal researcher, technology transfer to improve health and quality of life of the population in the world.

We investigate fundamental immunological mechanisms for health and disease. This includes tuberculosis, African trypanosomiasis, leishmaniasis, helminthic infections, as well as asthma, four of the ten most important human diseases by WHO. Our research strategy is based on knowledge by gain or loss function approaches in mice for a better understanding for human diseases mechanistically. With our state of art technologies and innovative approaches using inducible knockout models and genome-wide CRISPRi screen technology in conjunction with FACS sorting and Next-Generation Sequencing and proteomics, we do identify host-directed drug targets in mice and verified in humans. Some of our findings are already in the clinic, including tuberculosis, helminths and allergy disease, with more coming in the near future.

– Prof Frank Brombacher

HEALTH IMPACT

Our milestone to immunology of experimental human diseases using mouse models have been very successful and exceeded planned outcome – this can be evidenced best by our peer-reviewed publications.

Translation from relevant fundamental gene deficient mouse models to clinical research in humans: We unravel the complexity between immunity and infectious diseases with focus on Listeriosis, Tuberculosis, Leishmaniasis, Helminth infections and allergic diseases. Goals are to develop new preventive and therapeutic strategies and drugs to improve the health of South Africans.

Transformation from basic to clinical research

Our research in Immunology and Infectious Diseases is based on important research during the last five years with excellent publication and financial income from national and international. Most importantly we were able to transform from our basic research to clinical research in tuberculosis (EDCTP 5 million Euro from 2018 to 2022), in schistosomiasis (EDCTP 140,000 thousand Euro from 2017 to 2019). Our science in infectious diseases does develop new preventive and therapeutic strategies for human health using systems approaches for innovation. In collaboration with a South African company (Edelweiss) we produce a statin crème in order to reduce lesions in cutaneous leishmaniasis. We now initiated the crème in leishmania-infected in mice and preparing in clinical therapeutics.

Policy and Practice

Within Immunology and Infectious Diseases, we were the first to develop and generate gene-deficient mouse models by using embryonic stem cells from mice. We produced not only knockout mouse strain, but also developed cell specific and inducible gene deficient mouse strain over the years. Indeed, we were the first in South Africa. These mice were used in Immunology, Neurology, Cell Biology among many other faculties. We were highly successful and did send our mouse strains to all 4 continents with more than 150 collaborations up to now and over 230 publications.

DIGITAL TECHNOLOGIES FOR HEALTH

We work with FANTOM (Functional Annotation of the Mouse/Mammalian Genome), which is an international research consortium first established in 2000 as part of the RIKEN research institute in Japan to understand the mechanisms governing the regulation of mammalian genomes.

Gene-deficient mouse models has been used within biology and immunology and together with CRISP technology, we are now able to improve human diseases faster and better.

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SAMRC/UP STEM CELL RESEARCH AND THERAPY UNIT

Unit Director: Michael Pepper

OVERVIEW

Research conducted in the SAMRC/UP Stem Cell Research and Therapy Research Unit is translational in nature, aiming to introduce cell and gene therapies into the country to address South Africa's disease burden. Work on stem cells also aims to dissect the pathogenetic mechanisms underlying diseases that contribute significantly to South Africa's disease burden including HIV, cancer and obesity.

HEALTH IMPACT

The Unit is using cutting edge concepts and technologies in the fight against South Africa's burden of disease. Some of these include the introduction of gene therapy in the fight against HIV, understanding the effects of HIV on haematopoiesis through sophisticated flow cytometry and cell culture techniques, understanding of:

i. stem cell heterogeneity and

ii. the molecular mediators of adipogenesis through analysis of the transcriptome, and application of the omics (genomics, transcriptomics, metabolomics and microbiomics) to understanding the pathogenesis of neonatal encephalopathy with suspected hypoxic ischemic encephalopathy.

Policy and Practice

Work on a "cure" for HIV – the work was initiated in Pretoria several years ago, and then moved to Geneva and then Zurich (Switzerland). On the basis of IP co-owned

The FACS machine is an essential workhorse in the Unit

Culture of stem cells is central to the activities of the Unit

Preparing for a series of PCR reactions

Members of the Unit working hard into the night

Cell and gene therapy (C&GT) offer exciting new opportunities for the managment of several chronic and some rare diseases for which there is at present no cure. The high communicable and non-communicable disease burden in South Africa provides an excellent opportunity for the application of G&CT at scale, with benefits that will accrue to patients and their families as well as to society as a whole through health economic benefits. Our work is translational in nature and includes communicable (HIV, COVID-19) and non-communicable (obesity, cancer) diseases. Our approach is to understand disease pathogenesis and to apply mechanistic/molecular principles to prevention, diagnosis and treatment, with C&GT as our focus in the latter. Our aim is to have a positive impact on and improve the quality of life of South Africans, Africans and others, with clear objectives focused on C&GT for the next 5 years.

– Prof Michael Pepper

by the Universities of Geneva and Pretoria, we have now established a start-up company which is based in Geneva. The existing IP is being added to by ongoing work in Geneva and Zurich and will lead to the development of novel approaches to effecting a "cure". Work on optimizing gene therapy is also continuing in Pretoria.

Neonatal encephalopathy with expected ischemic encephalopathy (NESHIE) is a serious condition also known as "birth asphyxia" which may result in cognitive defects, cerebral palsy and seizures. The multi-institutional transdisciplinary project currently underway, in collaboration with investigators abroad, aims to increase our understanding of the pathogenesis of NESHIE in South Africa and possibly to identify novel biomarkers. This is one of the most important projects underway globally in this field and is currently funded by the SAMRC.

Work on the pathogenesis of obesity has evolved from the first publication (from our group), on the patterns of gene expression (transcriptome) during adipogenesis using human adipose-derived stromal/stem cells. Several potential novel candidate genes were identified, and their role during adipogenesis are now being explored in vivo.

Regarding cancer, we have undertaken an extensive analysis on patterns of gene expression in head and neck cancer, and in particular have observed a progression from normal to precancerous and finally to cancerous tissue. Work is also underway on breast cancer in a model of spontaneous mammary carcinoma in transgenic mice to determine whether exogenously added stem cells inhibit or potentiate the cancer.

Finally, our work on pharmacogenomics, with a focus on cardio-metabolic disease, is exploring the role and relevance of pharmacogenetics to the management of patients with cardiometabolic disease in the public health sector, with an assessment of the health economic implications.

DIGITAL TECHNOLOGIES FOR HEALTH AND RESEARCH TRANSLATION

We are generating large datasets in several of our research projects and are instituting and developing methods for data management (storage, access, sharing, and secondary use) in response to the imperatives outlined in the recent ASSAf genetics and genomics ELSI report.

Our work on pharmacogenomics employs an integrated digital platform for recording and integrating data from several sources including phenotypic and genotypic, with the goal of providing real-time effective responses to patient needs and thereby improving patient management.

The following platforms are used to disseminate information to the relevant stakeholders and general public: formal lectures, informal discussion, interactions with the media (print, broadcast and online). We have not yet used social media platforms to disseminate our findings but will do so in the near future.

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SAMRC/NICD ANTIBODY IMMUNITY RESEARCH UNIT

Unit Director: Lynn Morris

OVERVIEW

The use of vaccination to control infectious diseases remains one of the most significant public health interventions. However, the increase in the number of emerging viral pathogens such as COVID-19 pose an ongoing public health threat that requires the rapid development of new vaccines and therapies. Antibodies are a critical component of the host immune response to infection. A deeper understanding of the antibody response to infection combined with mechanistic studies to identify the correlates of protection is critical to inform these approaches.

For new pathogens or those that have proven refractory to vaccine development, the use of passively infused monoclonal antibodies for prevention and treatment is gaining momentum. The instant protection afforded by pathogen-specific antibodies makes this approach particularly appealing for outbreak situations such as COVID-19. Thus, efforts to identify and isolate anti-viral antibodies with therapeutic potential could assist in the fight against infectious diseases and help to identify better targets for vaccine design.

HEALTH IMPACT

New advances in active and passive immunization will be dependent on basic science discoveries. This requires an understanding of the pathogen and the immune responses during infection to provide a rational pathway for design of novel and/or improved preventative modalities.

The current major focus of the Morris/Moore laboratory has been the development of multiple techniques for identifying the targets of neutralizing antibodies to HIV, in conjunction with the simultaneous study of viral evolution. This dual approach is being utilized to identify natural or vaccine-elicited antibody responses for pathogens such as influenza, CMV and now SARS CoV-2 for which vaccines are either unavailable or not appropriate. In this way, the Antibody Immunity Research Unit (AIRU) applies existing technologies and innovative approaches to develop new vaccines and antibody therapeutics relevant to South Africa.

The Unit Director and her team have an excellent track record of mentorship and capacity building of post-graduate students and post-doctoral fellows. Students, fellows and staff have benefited from targeted training opportunities in laboratories of overseas collaborators through established programmes such as the Fogarty AIDS Training Programme (AITRP), the Gates CAVD Exchange Programme and the CAPRISA Centre of Excellence (CoE). A primary aim of the AIRU is to address the relative lack of black (and female) scientists through active recruitment and training of emerging black scientists, and to build and nurture future leaders of medical science in South Africa.

Policy and Practice

The National Institute for Communicable Diseases (NICD) team led the laboratory work that identified and isolated the human monoclonal antibody, CAP256-VRC26.25 that will be tested in a human clinical trial by CAPRISA. The AIRU will be integrally involved in this next phase performing the neutralizing antibody assessments and the viral sequencing. Importantly the AIRU continues to do research and development on this antibody lineage including bioengineering to improve function as well as exploring expression in different platforms.

The AIRU brings together a multidisciplinary team of leading researchers in clinical and basic sciences including virology, immunology, structural biology and bioinformatics both locally and internationally. This cross-fertilization between HIV and other infectious disease disciplines together with the latest technological approaches available through well-established collaborations with the Vaccine Research Center, Vanderbilt University and International AIDS Vaccine Initiative (IAVI) will provide numerous opportunities for innovative outcomes. Within the AIRU established mAb isolation technologies and reverse vaccinology approaches are being applied to ongoing vaccine /natural history cohorts.

The platforms currently being used for HIV that will be adapted for these and other pathogens include the

isolation of pathogen-specific antibodies by single B cell sorting, next generation sequencing (NGS) of B cell repertoires, antibody characterization through structural biology and the assessment of antibody Fc effector function.

DIGITAL TECHNOLOGIES FOR HEALTH

The AIRU has built a high-performance computer cluster to analyse large NGS datasets. The initial computer cluster designed to analyse MiSeq datasets was built by a former student as a part of his PhD who is now a post-doctoral fellow at Johns Hopkins University, USA (Mabvakure et al., 2019, Bioinformatics and Biology Insights). Since then we have upgraded this computer cluster to allow for the analysis of even larger datasets generated by the PacBio.

Current students are encouraged to use these new technologies in the biological context but also to develop computational tools, both hardware and software, to analyse such datasets. As technologies continue to advance, we will adapt our analysis techniques and capacity to do this work.

Our original high-performance computer cluster for bioinformatics analysis of NGS data was developed through re-purposing of old under-utilised computers providing a cost-effective solution for laboratories in low to middle income settings. The publication describing this advance (Mabvakure et al., 2019, Bioinformatics and Biology Insights) also serves as a "how to" guide, promoting the use of NGS and empowering laboratories to perform their own bioinformatics analysis.

The establishment of the SAMRC Antibody Immunity Research Unit (AIRU) in 2019 could not have been better timed. With the ongoing and rapid global spread of COVID-19 there is an urgent need to study the immune response to this novel virus. Because we had all the assays and platforms set up for measuring HIV antibodies we were able to quickly adapt and apply our knowledge to tackle SARS-CoV-2. Our long-standing local and international collaborations in the HIV field allowed us to access the necessary reagents and expertise quickly and also to link into clinical trial networks. The AIRU is now actively contributing to COVID-19 pathogenesis and vaccine research.

– Prof Lynn Morris

Next generation sequencing has major benefits for public health research including tracing the source of outbreak strains such as for listeriosis and COVID-19 (both of which were done at the NICD). Furthermore, NGS is used to study antibody responses to pathogens allowing us to identify potentially therapeutic antibodies that can inform the design of effective vaccines.

With the increased capacity of bioinformatics hardware comes the need for better software and software development. We are developing tools that can streamline data analysis and eventually diagnostic testing/outbreak tracking. Furthermore, we have an open data access policy and all data generated from our studies is uploaded to publicly available databases. Many software/tool developers do not generate their own datasets, thus having such datasets publicly available also enables other software/tool developers to create tools that would be beneficial to researchers for both data analysis and diagnostics.

RESEARCH TRANSLATION

Research findings generated within the AIRU have been disseminated to the scientific community by both staff and students who present their data at local and international scientific congresses. Research is published in peer reviewed journals and the AIRU receives funding from a number of agencies (SAMRC, NRF, NIH, Gates Foundation, IAVI and RCUK) and it is mandatory that we provide them with progress reports for the duration of the funding period.

Prof Penny Moore frequently speaks to primary school learners and to the Natural Science Teachers Cluster on the HIV epidemic and the importance of African science and scientists in solving local problems. In the past year Dr Nono Mkhize has given talks to scientists and community workers involved with the HIV Vaccine Trials Network (HVTN) on HIV neutralization assays being conducted in vaccine trials and the importance of infant testing. She also gave a talk to the African Local Initiative for Vaccinology Expertise (ALIVE) programme students, informing them on HIV vaccine trials in South Africa.

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SAMRC/CPUT CARDIOMETABOLIC HEALTH RESEARCH UNIT

Unit Director: Tandi Matsha

OVERVIEW

The SAMRC/CPUT 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.

HEALTH IMPACT

The Unit has pioneered research that investigates emerging alternate pathways that are linked with diabetes and cardiometabolic traits. In this regard the Unit has developed expertise and is the first to report on oral microbiome; periodontal diseases and diabetes; new markers, specifically glycated albumin and the diagnosis of diabetes; DNA methylation and microRNA profiling and established cut-off points for early screening of metabolic syndrome using radiological imaging.

Screening for Maturity Onset diabetes of the Young (MODY) has also been initiated.

Policy and Practice

During the period under review, research on microbiome and epigenetics has been progressing well – the Unit has completed analysis on potential biomarkers which we are waiting to test in a longitudinal cohort. On completion of this analysis, we are hopeful that new IP will be generated, and new assays developed.

Microbiome data has also yielded specific signatures that are associated with diabetes. Similarly, MODY research has provided hot spots that may explain the high prevalence of DM in our cohort and this work is currently being validated.

DIGITAL TECHNOLOGIES FOR HEALTH AND RESEARCH TRANSLATION

The Unit for Cardiometabolic Health Research hasn't been left behind when it comes to conducting research that support further research and innovation within the context of the 4IR relating to data management.

Through the microbiome and epigenetics work, the Unit is generating a huge data set from whole genome sequencing and currently instituting and developing methods for data management (storage, access, sharing, and secondary use) in response to the imperatives outlined in the recent ASSAf genetics and genomics ELSI report. Further, whenever our data is published, we deposit our data sets to international repository – this led to the Unit Director being the recipient of the 2018/2019 NSTF-South32 Awards in the Data Category.

In terms of the contribution towards improved (digital) technologies for health, the digital platforms that the Unit is using for microbiome and epigenetics allows integration of these huge data sets with the goal to provide a holistic approach in understanding the patho-physiological de-arrangement of diabetes and related complications. In addition, we hope to integrate all our data and develop an App that can be easily used for people to assess their risks.

Our studies are community based, as such we take the responsibility of disseminating our findings to the community seriously. At least twice a year we meet with the councillors and arrange slots to speak at community gatherings, or informal discussions. Our future plans are to use social media platforms to disseminate our findings to the wider public of South Africa.

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SAMRC/SU GENOMICS OF BRAIN DISORDERS RESEARCH UNIT

Unit Director: Soraya Seedat

OVERVIEW

The SAMRC/SU Extramural Unit on the 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 may be able to better predict disease development or treatment response.

This is achieved by addressing cross-cutting, translational neuroscience questions. The Unit is highly collaborative, and the suite of projects will provide opportunities that contribute to the development of scientific maturity and independence in basic and clinician-scientists and will equip them with the skills necessary to compete globally. Prof Hemmings and Seedat are members of the International Society of Psychiatric Genetics (ISPG) Global Diversity Task Force

(https://ispg.net/membership/committees/)

HEALTH IMPACT

The research conducted by the Unit cuts across several disciplines and research groups, all with a common goal of reducing the burden of brain disorders (BDs) in South Africa - innovative approaches include:

i. conducting the first SA population-based study to investigate gut microbial alterations in individuals with PTSD, anxiety and depression;
ii. creating cellular models of Parkinson's Disease to study functional effects of novel mutations, an important step in developing more effective drug targets;
iii. investigating the blood microbiome in schizophrenia, PD and PTSD;
iv. investigating alterations in the gut microbiome associated with FASD development;
v. conducting epigenetic and genetic studies early-after-trauma to understand the molecular pathogenesis of the early consequences of trauma and PTSD.

Being the only South African-led psychiatric-genetics-focused research programme in Africa, the Unit has existing collaborations with Ugandan researchers and will be extending its African footprint by establishing new collaborations in 2020 with researchers in other African countries (e.g. Kenya, Nigeria, Tanzania).

Policy and Practice

GBD has initiated several projects that will lead to impactful results and because the Unit is in the first year of funding, these projects are yet to be translated into policy and practice in South Africa. The Unit has awarded GBD Seed Awards to two up-and-coming neuroscientists namely:

Dr J Womersley who will investigate DNA methylation alterations in fetal alcohol spectrum disorder (FASD)

Dr P Swart who is currently co-investigator of a South African population-based initiative that aims to investigate the gut microbiome in neuropsychiatric disorders. Both projects are highly innovative and have much potential to influence further research, not only in South Africa, but globally.

In addition, the Unit has funded three micro projects investigating:

i. mitochondrial DNA sequence variation in individuals of African ancestry living with Parkinson's Disease,
ii. the possible neuroprotective properties of curcumin through monitoring of autophagy and apoptosis pathways and
iii. the role of functional dopamine- and serotonin-related genetic variants in reward and affective processing.

These projects are all innovative and, as pilot studies, have large potential to inform future studies.

The Unit intends to submit an application for an MSc in Neuroscience degree programme at Stellenbosch University. The Programme will be a cross-discipline, cross-faculty led programme focusing on research in genomics, imaging, bioinformatics, neuro-informatics, data mining and analysis of high-throughput 'omics' data and will be instrumental in establishing capacity in the neurosciences in South Africa, as the only research-based MSc in Neurosciences in Africa. It will speak to the Department of Science and Innovation's Research Infrastructure Roadmap, which encourages "omics" research with a view to ensuring that researchers have access to world-class scientific knowledge.

DIGITAL TECHNOLOGIES FOR HEALTH

The research carried out by the GBD is at the forefront of the 4IR and combines the sciences of "omics", with

cutting edge approaches in bioinformatics, in addition to state-of-the-art genetic collaborations with a wide range of international groups. Since the major ground breaker in genetic research will be systems biology and bioinformatics analyses, the Unit's ability to work with big data and to use artificial intelligence in computational molecular biology, is a priority.

In future research, the Unit intends to combine large datasets of whole genome sequencing data, phenotypic data, and brain imaging data from individuals from the unique South African population, which has the potential to lead to major breakthroughs in the field.

The Unit has initiated a research collaboration with a colleague at Cardiff University to harness machine learning and deep neural network approaches to answer key questions based on secondary neuroimaging data. The next step will be to apply the aforementioned approaches to integrated whole genome sequencing/phenotypic/ brain imaging datasets.

In terms of the contribution towards improved (digital) technologies for health, promotion of AI tools within the field will lead facilitation of clinical support and ultimately to monitoring of quality of care as more treatments are developed. Currently, two of the Unit's projects utilise online and mobile-based treatment/ prevention programmes for PTSD to determine whether these are feasible and useful in our setting.

GBD is also collaborating on an EU funded project known as MEGA (https://mega.turkuamk.fi/) to assess the feasibility of a nurse-led mobile App to screen adolescents with common mental health problems in primary care in South Africa.

There is also a plan to harness the power of combined neurotechnologies, over the course of SAMRC funding, by extending the Unit's platform to include non-invasive, MRI-compatible, brain stimulation techniques (e.g. rTMS and EEG) and virtual reality. These neurotechnologies will provide a unique opportunity to investigate causal relationships between targeted neural circuits and objective neurophysiological responses and will allow us to broaden our scope of research and build training capacity in multimodal imaging.

A CROSS-ER project (Cross-Cultural Emotion Recognition in traumatized individuals across the life span) has also been established through the Unit's membership to a research consortium known as the Global Collaboration on Traumatic Stress (https://www.global-psychotrauma.net/).

Recently, funding has been secured through the Faculty of Medicine and Health Sciences competitive Strategic Equipment fund, to set up a psychophysiological "lab", where data on emotional expressiveness and facial emotion recognition from outpatients with varying degrees of childhood maltreatment will be collected.

RESEARCH TRANSLATION

Research findings have been communicated at relevant forums, including both national and international conferences.

i. World Federation of Societies of Biological Psychiatry Congress, June 2019- symposium presentation (Hemmings, Suliman, van den Heuvel, Seedat)
ii. Research results and information about SAMRC GBD-related studies have been disseminated via websites (e.g. saneurogut.org; http://www.sun.ac.za/english/faculty/healthsciences/Molecular_Biology_Human_Genetics/anxietydisorders/Pages/team.aspx; https://www.sun.ac.za/english/faculty/healthsciences/psychiatry/imaging-in-neuroscience-workgroup)
iii. Educational talks (e.g. 14th Continued Nutrition Education Symposium, 2019 (S Hemmings))
iv. Radio interviews (to Talk Radio 702 and City Press online) (S Bardien)
v. YouTube videos (S Bardien): "PD Pioneer: Soraya Bardien on Parkinson's Disease and being a role model." https://www.youtube.com/watch?v=Pwb9Mj8nk3o&feature=youtu.be
vi. Public lecture, University of Bath (UK), March 2020 (Seedat)

In addition, every year, on World Parkinson's Disease Day (11 April) the PD researchers raise awareness about the disorder and about our research. The Unit hosts an event at Stellenbosch University where we have a stall and invite people to take part in some activity. Last year we held an interactive event and received very positive feedback from the approximately 100 participants.

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The Unit's focus contributes to the 'genomic medicine in brain disorders' movement in Africa, aiming to develop effective and culturally-appropriate treatments, and future utilisation of African genomic data in psychiatric care. In addition, the Unit has a strong focus on neuroimaging and imaging-genetics techniques to investigate causal relationships between neural circuitry and genetic and epigenetic mechanisms. The research we conduct will also result in improved computational capacity, the development of rich databases with extensive African phenotypic and 'omics' data, and increased skills related to psychiatry, genomics, bioinformatics, and physiological sciences, ensuring that African neuroscientists are equipped with the skills necessary to compete on the world stage.

– Prof Soraya Seedat

SAMRC/UCT PRECISION AND GENOMIC MEDICINE RESEARCH UNIT

Unit Director: Rajkumar S. Ramesar

OVERVIEW

The main objective of the Precision and Genomic Medicine Research Unit has been to extract maximum value from research in order to translate the knowledge of the genetic basis of disease for the benefit of our local communities. In this regard the Unit has designed unique panels of genes for both inherited retinal diseases and inherited colorectal cancers – the emerging findings are immediately validated and translated to genetic tests for clinical utility.

The National Health Laboratory Service is a natural partner for translation available through a nationally accessible referral network. Furthermore, our ongoing efforts in psychiatric genetic consider the burden of mental ill-health – and have focused on the genomics of schizophrenia in the indigenous Xhosa population, a true reflection of transformative and locally relevant research.

HEALTH IMPACT

The work being done by this Unit is focused on understanding the genomics of our indigenous African populations. What we realise at the same time, is that a major effort needs to be made in ensuring that 'medical genetics education' is made available in a palatable form at the common denominator of health i.e. the coalface which is represented by the nurse practitioners.

In this regard the Director has been centrally involved in developing and delivering an education programme throughout Africa (Nembaware et al., 2019); similarly, this kind of education/training is also aimed at high school children in the Western Cape province. These efforts are transformative in terms of genomics gaining traction in society and healthcare.

Policy and Practice

i. The Director's role as Chair of the National Department of Health's Technical Working Group for Genetic Service Guidelines – serves as recognition that the research being done in the Unit – has translational relevance to genetic service delivery, nationally. The Unit Director was co-chair of a recently held World Health Organization (WHO) Expert Meeting on Genomics and Genetic Disorders held in Pretoria (8-11 April 2018). The purpose of the meeting was to review the work that had been done with the WHO Genomics and Human Health towards devising policies and guidelines for Genetic Services especially in low- and middle-income countries (LMICs).

ii. Importantly – the Unit's research is directly responsible for the first clinical trials being conducted on genetic disorders in Africa. Our identification of the genetic basis of a retinal disease, Stargardt Disease, has attracted a clinical trial to South Africa, with the best recruitment rates internationally (http://www.retinasa.org.za/first-ever-clinical-trial-in-south-africa/). Our identification of the genetic basis of heritable colorectal cancers, led to the clinical trial of Aspirin to delay onset of colorectal cancer in mutation positive individuals. The significant protection in mutation positive individuals (compared to controls) has been accepted for publication in the journal, Lancet.

DIGITAL TECHNOLOGIES FOR HEALTH

Genomics research has of necessity developed paradigms for big data generation/storage and analysis in the sphere of health sciences. This has emanated alongside if not integrally as part of the original Human Genome Project. In this regard, even though genomics is not seen as mainstream practise especially in LMICs – it is influencing data capture, storage and potential of convergence across the health sciences. In this regard, we are actively engaged with the SAMRC and Department of Science and Innovation in order to optimally influence the national informatics infrastructure – where the SAMRC would be the custodian of human health-related data, including genomics. The PI's role as Head of the Dept/School of Pathology at UCT, and his role as one of three members of the National Genetics Expert Committee for the NHLS – has been pivotal to discussions regarding the big data capability of the NHLS, as a major stakeholder in terms of capturing health-related data nationally, and monitoring human health.

The Unit is integrally involved in next generation sequencing technologies and handling of big data, within which informatics and robotics are core. The Director is currently engaged with the NHLS, SAMRC, Western Cape Health Data Warehouse towards developing a digitised health ecosystem – within which genomics would be core. This work is in the early stages of development but has

immense promise in terms of the 4th Industrial Revolution materialising to be of benefit to our populations.

RESEARCH TRANSLATION

In the first instance: our emphasis on education/tracking of 'Genomics and Human Health' at both high school level as well as to nurses across Africa – is to target potential newcomers into the field to be excited by this field, and especially to introduce them to genetics, human health and computational sciences at an early stage. This helps students decide early to pick up e.g. majors computer science and genetics, or the physical sciences (maths/physics), and molecular biology, as good choices for degrees and rewarding careers. Equally, the communication with and education of nurses (Nembaware et al., 2019), is aimed at the frontline of health care, where nurses are the first to see individuals/families – ranging from immediately ante-natally, and throughout their lives, both in the community, as well as in clinics. Recognising genetic factors associated with disease as a community health principle is proving very beneficial.

The ongoing use of genetics as the basis for managing wide-ranging communities at risk for colorectal cancer is well established. In this regard, the participation of our cohort in an international clinical trial, showing the protective role of Aspirin (delaying onset of colorectal cancer) has been published in the Lancet, and international guidelines for patients with Lynch syndrome have also been published. Our work on the genetics of colorectal cancers has also attracted and led to completion of excellent work on colorectal cancers in Zimbabwe (for a PhD by Dr Leo Katsidzira a Gastroenterologist from Zimbabwe supervised by the Director; Katsidzira et al., 2019a; 2019b), as well as the influence of host genetics in the development of cervical cancer in indigenous African women (this was the PhD of Dr Ramadhani Chambuso, an oncologist from Tanzania supervised by the Director; see Chambuso et al., 2018, 2019; 2020). For our research on the genetics of inherited retinal disease, the first clinical trial for a form of juvenile macular degeneration (Stargardt Disease) has been attracted to South Africa http://www.retinasa.org.za/first-ever-clinical-trial-in-south-africa/). The Community Advisory Board has been crucial in us establishing and maintaining an excellent relationship with the communities in which we work (both in the Eastern and Western Cape Provinces) and providing feedback.

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This Unit has always striven towards translation of cutting edge research into patient benefit.

The ongoing research into retinal degenerative disorders has given us the opportunity to bring the advantages of next generation sequencing technologies to the detection of familial mutation in an ever increasing number of South African patients. Apart from the benefit of knowing the genetic cause of disease in relation to reproductive planning and phenotype resolution, a number of our patients are now eligible for inclusion in Gene Therapy trials based on the specific knowledge of their mutation status. The extension of the research carried out by this Unit into the genetic causes of familial colorectal cancer, Lynch Syndrome, is yielding new insights into the mutation profile of African Lynch Syndrome patients while enabling us to develop an algorithm for detecting Lynch Syndrome patients in the population of patients presenting with colorectal cancer in the Western Cape. This algorithm will be extensible to all rural and urban clinics and should greatly improve the identification of Lynch Syndrome patients and allow us to offer them, and their families, the benefits of familial screening and follow-up.

The work of this Unit in the next five years will focus on refining these services to our patients and extending them into all the diverse populations of the whole country.

– Prof Rajkumar S. Ramesar

SAMRC/UP PRECISION PREVENTION AND NOVEL DRUG TARGETS FOR HIV-ASSOCIATED CANCERS RESEARCH UNIT

Unit Director: Zodwa Dlamini

OVERVIEW

The Precision Prevention and Novel Drug Targets for HIV-Associated Cancers is one the seven extramural research units recently launched by the South African Medical Research Council. Its main research investigates the underlying molecular changes associated with Oesophageal and Cervical Cancer in South Africa, Tanzania, China, Brazil, and India as well as potential risk factors in order to reduce morbidity and mortality associated with these cancers.

The key unmet medical need that this research is addressing is the discovery of clinically actionable biomarkers and targets for the development of novel therapeutics for treatment and guiding treatment decisions in cervical and oesophageal cancer.

The Unit therefore, is investigating whether the mutational landscape underlying the disease differs between populations by looking at a more global molecular characterization of cervical and oesophageal cancer in South Africa, Tanzania, China, India, to improve the understanding of the molecular and drug responsiveness profiles of these cancers in these populations. Specifically, the Unit uses whole genome RNA-sequencing to map the mutation landscape and biological pathways involved in cervical and oesophageal cancers in these populations.

HEALTH IMPACT

With only few months since its establishment, the Unit is using cutting edge technologies to address HIV-associated cancers. It is true that high residual burden of infectious agents HIV/AIDS, human papillomavirus (HPV), hepatitis B virus (HBV) in certain sub Saharan African (SSA) countries still drives the rates of common cancers. Cancer control action in SSA requires measures that address the persistently high incidence of cancers associated with poverty and infection.

The Unit is the first that is advancing splicing regulation which is clearly important in tumorigenesis caused by tumour viruses because in some cases, viral oncogene transcripts are required to be alternatively spliced to produce tumour-promoting protein isoforms. Moreover, the growth-promoting properties of tumour viruses can lead to cellular alterations that promote expression of splicing factors. In this case, increased expression of splicing regulators can lead to production of altered mRNA isoforms whose protein products have tumour-promoting activity. The molecular hallmarks of latency and persistence in HIV infection, abnormality in splicing and carcinogenesis are not yet understood and this unit is addressing this.

Also, the Unit has started cutting edge translational work with University of Texas MD Anderson Cancer Center and The University of Nottingham Cancer Center. This is due to the emerging evidence that cancers with deregulated splicing pathways are particularly sensitive to protein arginine methyltransferases (PRMT) and splicing factor kinases (SFK) inhibitors. The Unit therefore identifies molecular networks and exploit the vulnerability of HIV-associated tumorigenesis with aberrant splicing signatures to protein arginine methyltransferases (PRMT) and splicing factor kinases (SFK) inhibitor-based therapies.

Policy and Practice

i. Apoptosis in cancer cells is induced by alternative splicing of hnRNPA2/B1 through splicing of Bcl-x, revealed by a South African natural product extract.

We have already undertaken work with one natural product, identified the NMR structure of the active compound, and identified a novel specific splice factor inhibitor that alters expression of 71 genes, including DNA cell cycle arrest genes, and 1600+ skipped exons, and 750 alternative 5′ or 3′ splice sites at an FDR<10-5 in cancer cells (Makhafola et al., submitted). This work is currently being done in Australia by a chemist to synthesise more compounds which are also going to be tested in the laboratory as was done with the extract.

This work has led to a multinational study below which is a collaboration between the Unit and the University of Texas MD Anderson Cancer Center, University of Nottingham Cancer Center, Kenya Medical Research Institute and University of the Western Cape:

ii. Targeting Cancers with HIV-Infection Enhanced Risk Using Splicing Disruptor Drugs

This project identifies molecular networks that regulate alternative splicing in HIV-associated cancers and exploits these aberrant splicing signatures as vulnerabilities using protein arginine methyltransferases (PRMT) and splicing factor kinases (SFK) inhibitor-based therapies. Splicing regulation is clearly important in tumourigenesis caused by tumour viruses. In some cases, viral oncogene transcripts are required to be alternatively spliced to produce tumour-promoting protein isoforms.

Moreover, the growth-promoting properties of tumour viruses can lead to cellular alterations that promote expression of splicing factors. In this case, increased expression of splicing regulators can lead to production of altered mRNA isoforms whose protein products have tumour-promoting activity. The molecular hallmarks of latency and persistence in HIV infection, abnormality in splicing and carcinogenesis are not yet understood.

There is also emerging evidence that cancers with deregulated splicing pathways are particularly sensitive to protein arginine methyltransferases (PRMT) and splicing factor kinases (SFK) inhibitors. We have proposed that HIV-associated cancers, with aberrant splicing signatures, may also be vulnerable to PRMT and SFK inhibitor-based therapies, and we are in the process of testing this hypothesis. The current state of alternative splicing in cervical, colorectal and prostate cancer is that while characterisation of RNA splicing in some non-HIV associated cancers in the US and UK has been undertaken, there is no current understanding of the expression characteristics of alternative RNA splicing from African patients.

DIGITAL TECHNOLOGIES FOR HEALTH AND RESEARCH TRANSLATION

The Unit generates large data sets which for now, are stored at the University of Nottingham Cancer Centre while plans by the University of Pretoria are underway to provide facilities that will ensure that it is available for access and sharing.

A new partnership is forming with the engineering-based Medical College at the University of Illinois to be able to advance on AI and Big data in Cancer and to be able to collaborate internally with the Faculty of Engineering in this 4IR space. The Director, Prof Zodwa Dlamini is also part of the National Precision Medicine Think Tank and highly involved in the establishment of the whitepaper in this area which is inclusive of big data.

A collaboration with Theralon (PTY) LTD has started, to access cutting edge technology which is currently being rolled out in selected regions in the EU, some already in clinical trials, where patient derived biopsy tissue can be used for predictive drug response and drug discovery studies in a near-perfect human physiological mimicry environment.

The traditional drug discovery pipeline is laborious and expensive, with many stage gates and low success rates – using the licensed technology will provide a cost-saving predictive model: By testing on 3D cultured cells or biopsy tissues instead of cells/rodents, a faster turnaround in academic applicability of new drug candidates can be determined.

This will enable the Unit to investigate the efficacy of various new and existing cancer treatments on patient-derived biopsy tissue/PDX models, without harming the patient, to determine the best approach to treat the individual patient. Ethnopharmacological compounds, such as traditional medicines, will provide a more accurate predictive model of determining efficacy, as the technology is standardised which implies a result obtained in Africa will be the same result obtained in the EU/USA if the same protocols are used.

The Unit is in talks with Pfizer who have interest in working and supporting the Unit in the area of early diagnosis of cancer. We are publishing our work also in international journals – one original paper submitted and two multinational reviews on oesophageal and cervical cancer that have been accepted and in the process of being published.

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SAMRC/UCT WOUND HEALING AND KELOID SCARRING RESEARCH UNIT

Unit Director: Nonhlanhla Khumalo

OVERVIEW

The SAMRC/UCT Wound Healing and Keloid Scarring Research Unit aims to advance the scientific scrutiny of neglected common clinical problems that predominantly affect patients of African ancestry. This research unit is an opportunity to create the best possible environment for the discovery of effective treatments for keloid scarring because, for the first time, access to large numbers of affected patients, high-end equipment, significant clinical skills and research expertise have come together in one place, in Africa.

Although new the Unit attracted two PhD African students (1 male, 1 female) who relocated from the Province of KwaZulu-Natal to Cape Town. We have also attracted a postdoctoral fellow from the Eastern Cape. These students are interested particularly because the project investigates a condition that is all too familiar in the communities.

HEALTH IMPACT

As an African female myself I belong to an underrepresented demographic group. Further, my research interests were significantly influenced by the suffering I see in my community because lack of research or novel discoveries for treatment. It does not help that dermatology as a discipline is very lucrative in private practice and very small – with about 200 dermatologists practicing in South Africa. The situation is dire in academic institutions with 2-3 consultants in each of the 9 medical university overloaded with significant clinical and teaching responsibilities.

The Hair and Skin Research (HSR) Lab at UCT was the first basic science laboratory in the country, setup to compliment the well-established excellent clinical work in South Africa. The SAMRC was hugely supportive through the mid-career programme without which we would not have been able to run the HSR lab.

One transformative programme that has come out of the HSR lab is the new Advanced Diploma in Cosmetic Formulation Science the first of its kind in Africa that has allowed unemployed science graduates (who understand adverse effects of cosmetic ingredients) access and positions in the cosmetic industry – we have graduated 25 in the first 3 years of the programme.

Policy and practice

The Unit aims to contribute to health policy and practice with studies that provide evidence of widespread use of illegal and/or toxic concentrations of ingredients in cosmetics. Currently setting multi-disciplinary panels to review relevant policies and legislations. The Unit is producing increasing evidence that suggests that scalp hair (that has a very rich blood supply) incorporates various chemicals from the blood. Consequently, we have been able to show in case control studies that hair cortisol levels are higher and precede the event in patients following a heart attack; in another that hair glycation in diabetics is higher than in healthy controls. Both studies are being prepared for publication, but have already each resulted in a Masters degree qualifications.

DIGITAL TECHNOLOGIES FOR HEALTH AND RESEARCH TRANSLATION

The pilot studies mentioned above suggest the potential use of hair as a testing substrate in medicine. However, for that to happen requires some assurance about its reliability as a substrate. Current data suggest that although the keratin complement in human hair seems consistent, curly hair has a higher content of structural lipids that involve in protein folding. If that is the case, higher lipid content may enable incorporation of higher concentrations of lipophilic chemicals in curly compared to straight hair which could confound interpretation of results. To understand the relationship between hair curvature, colours and biochemistry we are using an approach which is summarized in a recent publication (Front. Physiol. 2019) entitled: "A Systems Approach to Human Hair Fibers: Interdependence Between Physical, Mechanical, Biochemical and Geometric Properties of Natural Healthy Hair."

The preliminary studies mentioned above compared hair testing using wet-lab methods with Fourie Transformed Infra-Red (FTIR) Spectroscopy and the preliminary data are very promising. This technology identifies chemical fingerprints without sample preparation e.g. directly on a strand of hair. Thus, there is a potential for developing hand-held FTIR devices that can be used for screening various chemicals of interest in hair.

Popular press has publicised various of our studies on toxic ingredients in cosmetics.

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SAMRC Midcareer Proteomics and Analytical Team

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 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.

TUBERCULOSIS COLLABORATING CENTRE FOR CHILD HEALTH (TB-CHILD)

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ADVANCING CARE AND TREATMENT (ACT) FOR TB/HIV

Contact: Prof Gavin Churchyard
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SOWETO MATLOSANA SAMRC COLLABORATING CENTRE FOR HIV/AIDS AND TB

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CENTRE FOR TUBERCULOSIS BIOMARKER-TARGETED INTERVENTION

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CLINICAL AND COMMUNITY HIV-TUBERCULOSIS RESEARCH COLLABORATING CENTRE

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WITS CLINICAL HIV/TB RESEARCH UNIT

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WITS RHI COLLABORATING CENTRE FOR HIV/AIDS

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TB FREE THROUGH RESEARCH AND INNOVATION

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CENTRE FOR BASIC AND TRANSLATIONAL HUMAN TB RESEARCH

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TYGERBERG SAMRC COLLABORATING CENTRE FOR HIV LABORATORY RESEARCH

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CLINICAL CANCER RESEARCH CENTRES

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

Communications and stakeholder engagements

The 2019/20 financial period marked a milestone moment of the SAMRC's 50th celebration of research, innovation and development. Key stakeholder engagements included conferences, staff activities and the 50th Anniversary media programme (refer to Achievements and highlights section, page 10-14).

STAKEHOLDER ENGAGEMENTS

ENGAGEMENT	OBJECTIVE
SAMRC Research Capacity Development Annual Grant holders Meeting, 5-6 Feb 2019 Theme: Developing science leaders today for a healthy South African future	• Meeting to empower scientists who have been awarded grants to conduct health research • At the close of the financial year 2018/2019, in a competitive process a total of R22, 400,000.00 has been awarded to fifty scientists from various universities across South Africa • Scientists conduct research under five strategic programmes, each with the unique intention to catapult transformation in how the SAMRC funds research while responding to identified gaps in heath research
FameLab Science Communication Initiative, 7 – 8 Feb 2019	• Training session on communicating science to the public & media hosted (7 Feb) • Institutional heat and finals held at SAMRC, Cape Town Conference Centre (8 Feb) • 17 young scientists participated in day 1 training and day 2 the institutional heat/ finals
Bongani Mayosi National Health Scholars Programme Event, April 2019	The collaboration between the National Department of Health, the Public Health Enhancement Fund (PHEF) and South African Medical Research Council (SAMRC) has been catalytic. PHEF, a non-profit entity created to leverage and contribute to strengthening the health sector, shows private sector's commitment to building the healthcare system. Through the Bongani Mayosi National Health Scholars Programme, administered by the SAMRC, the Programme has produced 47 graduates (87% of which are PhDs) in various health professions.
BIO 2019, 3-6 June 2019	Bio 2019 is the largest Biotechnology event worldwide; this year saw well over 17 000 delegates from across the world at Bio under one roof. The South African Medical Research Council (SAMRC) represented by the Corporate & Marketing Communications Division took the lead with coordinating the South Africa pavilion (exhibition) for the event. In collaboration with the Department of Science and Innovation, the Technology Innovation Agency (TIA), the SAMRC managed key elements of the SA pavilion. The SA pavilion was represented by the Department of Science and Innovation, SAMRC and TIA and included a range of companies supported or collaborating with the three entities or those involved in the SA biotech sector.
9th SA AIDS Conference, Durban, 11-14 June 2019	Several scientists contributed to the 9th SA AIDS Conference through oral and poster presentations. The SAMRC had an exhibition showcasing some of its work. *Interviews SA AIDS Conference 2019* • Professor Glenda Gray spoke to the Drive on METRO about the journey to finding an effective HIV vaccine. | Metro FM | 12 June 2019 • Professor Glenda Gray spoke to 702 about the strides that have been made by medical researchers in developing new ways to combat the global AIDS problem. | Radio 702 | 12 June 2019 • Prof Glenda Gray spoke to Cape Talk and elaborated on innovative scientific, social and digital technologies that could help to control the HIV/AIDS epidemic. | Cape Talk | 13 June 2019 The SAMRC's HIV/AIDS experts including Glenda Gray and Fareed Abdullah were in attendance and were interviewed and quoted by various news publications and broadcasting channels. Gray was the most featured representative in June 2019 and was interviewed live at the event by eNCA News following her presentation. Gray also authored an article in The Conversation talking about the big three studies pushing at the frontiers of HIV prevention. Her article was syndicated across various publications including Health24, De Kat and MyZA.

ENGAGEMENT	OBJECTIVE
Genomics Centre launch, July 2019	"The Centre is a national asset that will contribute to the better understanding of factors that impact on the health of South Africans and inform strategies to improve their response to diseases. We are now a part of a small group of forward-thinking countries that are pioneering genomic science to address the burden of disease in Africa which carries the greatest genetic diversity," Professor Glenda Gray, SAMRC President and CEO.
SAMRC hosted Science and Tech Delegations from China in July 2019	i) Hosted Deputy Director General Liu and the delegation from the Ministry of Science & Technology, China. Topics: science and technology system, research funding, and research integrity and technology institutions. ii) Hosted Director-General of China Science and Technology Exchange Centre, Mr Chen Jiacheng. Topics: Ministry of Science and Tech Young Scientist Exchange Programme (China),Enhancing mutual research and development aspirations between South Africa-China.

MEDIA RELATIONS MANAGEMENT

A. Press Releases

The following Press Releases were issued in the reporting period:

MARCH 2020
Mobilising resources against the COVID-19 pandemic
Enhancing health research and surveillance against COVID-19 in South Africa
SAMRC documentary uncovers the relationship between gender or gender (in)equality and violence
The South African Medical Research Council and Wits University join forces in a new study to intervene early to tackle childhood obesity

FEBRUARY 2020
One of the HIV vaccine efficacy studies is stopped due to non-efficacy

DECEMBER 2019
Leading South African Immunologist and public health advocate recognised for championing evidence-based science
Two-day National Dialogue to focus on Universal Health Coverage
SAMRC to honour distinguished scientists at a 50th Gala Event
Response to the editorial feature: Decolonise Plan S, South African academics hear

OCTOBER 2019
SAMRC - making open access to research publications a reality
World leaders in sexual violence prevention gather to advance research on violence against women (VAW) in low and middle-income countries
SAMRC supports global ban on lead in paint
A hope for kidney transplants for people living with HIV
SEPTEMBER 2019
Thai HIV vaccine shows promising results for South Africans
Global Alliance for Chronic Diseases agencies commit USD 50 million to scaling up research in the fight against chronic diseases
SAMRC to commence the third National Femicide Study
JULY 2019
Health Department Launches the National Malaria Elimination Strategic Plan 2019-2023
First- High through-put-genomics sequencing centre in Africa to decode genes
Renewed impetus to prevent and control diarrheal diseases in African children
Global Science Academies take a stand against air pollution
JUNE 2019
Call for nominations: SAMRC Scientific Merit Awards
One Innovation, One Vision and South-South Collaboration To Advance Health Innovation
Professor Jeffrey Mphahlele, SAMRC's VP for Research Appointed Vice-Chair of EDCTP
APRIL 2019
NDoH and PHEF celebrate their investment in human resources for health in honour of the late Prof Bongani Mayosi
SAPRIN releases its first population dataset to track South Africans' health and wellbeing
Professor Glenda Gray appointed for a second term at the SAMRC

B. Media Performance

The independently measured media performance of the SAMRC is reflected below:

TITLE	AVE VALUE MEASURED
AVE generated for print media	R19 453 242
AVE generated for broadcast media	R6 149 679
AVE generated for online media	R6 398 610
Total AVE generated by the SAMRC (1 April 2019 – 31 March 2020)	**R32 001 531**

AVE refers to the Advertising Value Equivalent that an article has generated

COVERAGE TYPE	NUMBER OF ARTICLES
Number of articles considered as positive coverage	471
Number of articles considered as neutral coverage	376
Number of articles considered as negative coverage	1
TOTAL number of articles generated	848

Note:
Negative articles are described by the issue reported on and are not a reflection that the SAMRC's reputation was brought into disrepute or was perceived negatively in the articles.

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 precepts 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 & other mandates

The Legal & Compliance Services Division of the SAMRC has identified 49 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 SAMRC Act is currently under review. The SAMRC Board, the NDoH, the NDoST and the Parliamentary Portfolio Committee of Health have been briefed about the contemplated review of the SAMRC Act.
- The National Health Act 61 of 2003
- Intellectual Property, Rights from Publicly Financed Research and Development Act, 2008
- Employment Equity Act 55 of 1998
- 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.

Engagement with the portfolio committee on health

The SAMRC is accountable to Parliament through the Parliamentary Portfolio Committee of Health. The SAMRC regularly responds to invitations from the Committee. During the 2019/20 reporting period the following presentations took place.

DATE	DISCUSSION
18 September 2019	2019/20 Annual Performance Plan (APP) and budget for the 2019/20 financial year
10 October 2019	2018/19 Annual Report

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".

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.

The Act furthermore mandates the Board to designate an Executive Management Committee, consisting of the President and other members who are employees of the SAMRC, and who, subject to the directives and control of the Board, are responsible for managing the affairs of the organisation in accordance with the objects and policy of the SAMRC.

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 30 July 2019 and no amendments to the Charter were deemed necessary.

The Board Charter requires an annual assessment to be conducted of the Board, its Sub-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 December 2019.

BOARD MEMBERS
1 NOVEMBER 2019 – 31 MARCH 2020

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

DR TIMOTHY TUCKER

PROF EUNICE SEEKOE

ADV DOROTHY KHOSA

MS JUNE WILLIAMS

PROF GLENDA GRAY

BOARD MEMBERS
1 APRIL 2019 – 31 OCTOBER 2019

PROF MIKE SATHEKGE
BOARD CHAIRPERSON

PROF QUARRAISHA ABDOOL KARIM
BOARD VICE CHAIRPERSON

DR ZILUNGILE KWITSHANA

MS NAFEESA KAWDA

PROF BRANDON SHAW

PROF ELIZABETH BUKUSI

DR PATRICIA HANEKOM

PROF JOHNNY MAHLANGU

PROF LINDA SKAAL

PROF LINDIWE ZUNGU

DR RACHEL CHIKWAMBA

PROF MARK COTTON

PROF SITHEMBISO VELAPHI

PROF THOLENE SODI

PROF WILLIAM RAE

PROF GLENDA GRAY
PRESIDENT & CEO

COMPOSITION OF BOARD: 1 NOVEMBER 2019 – 31 MARCH 2020

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 (Haem), linical haematology subspecialist; Cert Clin Haem, Clinical haematology subspecialist; FCPath, Haematologist; MBBCh, Medical practitioner; BSc (Lab Med), Scientist	Clinical Haematologist with special interest in haemostasis and thrombosis, clinical trials and other aspects of clinical and diagnostic haematology and pathology.	• Poliomyelitis Research Foundation Board. • WITS Health Consortium Board	Board	2
Prof L Zungu	Member	1 Nov 2016	n/a	PhD in Occupational Health (UNIZUL); MCur in Community Health (UNIZUL); BCur (Hons) (UNISA); Post Graduate Diploma in International Research Ethics (UCT), Global Clinical Scholars Research Training Programme (Harvard University)	Occupational health and safety; Community Health	• Member of the online Examination Board at Texila American University • Board member at HSRC and MINTEK. • Member of University Council at UNISA.	Board REMCO	2 0
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 RI&D	1 0
Prof B Shaw	Member	1 Nov 2016	n/a	D.Phil (Biokinetics); M.Phil (Biokinetics); B.A. Honours (Biokinetics) cum laude; B.A. Honours (Sport Science); B.A. (Humanities)	Exercise Science and Biokinetics: cardiopulmonary disease; non-communicable disease (NCD); hypokinetic disease	• Editorial board: ACSM's Health and Fitness Journal • Executive Director: Africa & Vice-President: Publications and Communication – International Physical Activity Projects (IPAP)	Board EXCO ARIC	2 0 1
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 EXCO ARIC	2 0 1
Prof T Sodi	Member	1 Nov 2016	n/a	Honours Degree in Psychology; Masters Degree in Clinical Psychology; PhD (Psychology); Registered Clinical Psychologist	Mental health; Mental health policy; Culture and ethics; Suicide; Health and behaviour; Mental retardation; Implementation research, 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 EXCO REMCO	2 0 0
Prof S Velaphi	Member	1 Nov 2016	n/a	MBChB; MMed; FC Paed, Fellowship in Perinatal Neonatal Medicine, PhD	Neonatology	• Clothing Company for Church Clothes/Uniform • Nelson Mandela Children's Hospital – Board member	Board R&D	2 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 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 Reigional 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 EXCO R&D	2 0 0
Prof E Mukwevho	Member	1 Nov 2019	n/a	PhD Anatomy& Cell Biology; MSc Molecular & Cell Biology; BSc (Honours) Biochemistry; Bachelor of Science; Certificate in Project Management; Certificate in Financial Management; MBA	Obesity and Diabetes Metabolic syndrome Mitochondrial Energy metabolism Epigenetics of the Obesogenes	• n/a	Board R&D	2 0
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	2 0
Prof T Tucker	Member	1 Nov 2019	n/a	MBChB; PhD; F.C.Path (SA)Viro	Clinical Virology Health Systems Strengthening Pathology Laboratory Service Clinic-Laboratory-Interface Public-private-partnerships	• National Health Laboratory Service – Board Member • NHLS Research Trust – Board member • SEAD Consulting (Pty) Ltd – Shareholder and board member • Champagne Valley Trust – Trustee • Tucker Family Trust – Trustee • NIH Strategy Working group on HIV/AIDS – US Gov – Committee Member • UCT School of Public Health and Family Medicine – Adjunct Assoc. Professor	Board REMCO	2 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 R Carolissen	Member	1 Nov 2019	n/a	DPhil (Psychology); MA (Clin. Psych); Higher Diploma in Education (H.D.E.); 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: • Psychological Association of South Africa: Member of Council and Chair of Division of Community and Social Psychology (Sept 2015-Sept 2019)	Board REMCO	2 0
Adv D Khosa	Member	1 Nov 2019	n/a	Bachelor of Laws (LLB); Master of Management; Labour Dispute Resolution Practice; Certificate in Principles of Business and Management; Diploma in Labour; 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 and 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	2 0
Ms J Williams	Member	1 Nov 2019	n/a	Bachelor of Science; Higher Diploma in Education; BSc Honours; Accountant's Conversion Course; Postgraduate Diploma in Accounting; B Comm Hons in Accounting CA(SA)	Audit and Finance	• Boland TVET College Council • Robben Island Museum Audit, Risk & IT Committee • Western Cape Gambling and Racing Board Audit Committee • Breede River Municipality Audit and Performance Audit Committee • Stellenbosch Municipality Audit and Performance Audit Committee	Board ARIC	2 1
Prof T Mavundla	Member	1 Nov 2019	n/a	B Cur Nursing Education; IPHC Intensive Primary Health Care; 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	2 1
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	• Technology Innovation Agency – Board Member	Board ARIC	2 1

COMPOSITION OF BOARD: 1 APRIL 2019 – 31 OCTOBER 2019

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. M Sathekge	Chairperson	01 Nov 2010	n/a	MB ChB, MMed (Nucl Med), PhD. Professor, Chief Specialist and Head of Department of Nuclear Medicine	Design and implementation of novel point-of-care targeted diagnostics and therapies using molecular nuclear medicine to address cancer and the dual curse (HIV &TB)	• President of the Colleges of Medicine of South Africa (National Specialist Examining body) • President of International Society of Radio labelled Blood Elements (ISORBE) • Governing Board of the World Association of Radiopharmaceutical Therapy	Board EXCO R&D	6 0 2
Prof Q Abdool Karim	Deputy Chairperson	1 Nov 2016	n/a	PhD (Medicine); Diploma in Public Service Management (cum laude); MS (Parasitology); Higher Education Diploma (Post-graduate); BSc (Hons) (Biochemistry); BSc (Microbiology, Biochemistry) NRF A rated scientist; Fellow: Royal Society of South Africa; Academy of Science of South Africa; African Academy of Science (Vice-President: Southern Africa); The World Academy of Science; Organisation of Women in Science and Development; US National Academy of Medicine (Foreign Associate)	HIV/AIDS, Sexual reproductive health, surveillance, Adolescent Health, Implementation Science	• PEPFAR Scientific Advisory Board • MAC AIDS Foundation Board	Board EXCO R&D Chair	5 0 2
Dr R Chikwamba	Member	1 Nov 2016	n/a	MBA; PhD; Member of the Academy of Science of South Africa (ASSAF Member, South African Council for Natural Scientific Professions; Dr Chikwamba sits on various boards focusing on agriculture, conservation and health, notably the Global Governing Board of ICRISAT, the Board of Directors of the Wits Health Consortium (Pty) Ltd, the South African Medical Research Council and is the chair of the Advisory Board of the Applied Center for Climate and Earth System Sciences (ACCESS).	Life sciences and health; Leadership, strategy development and execution; Research and development strategy, management; Strategic partnerships and business development; Strategic communication and stakeholder engagement; Governance.	• Member of Advisory Committee of the Academy of Science of South Africa (ASSAF) • Member of Applied Center of Climate and Earth System Science (ACCESS) • Global Governing Board of ICRISAT • Global Oversight Council: Vital Signs • Board Member, WITS Health Consortium (PTY) Ltd. • African Union (AU) High–Level committee on Science, Technology and Innovation Strategy for Africa 2024 (STISA 2024)	Board REMCO	2 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
Dr P Hanekom	Member	1 Nov 2010	n/a	BSc; BVMCH (Veterinarian); Postgraduate Diploma in Economic Principles MSc in Financial Economics	Financial and economic analysis and research Strategic planning Project management Governance and accountability	• Pikitup SOC • Mapungubwe Institute of Strategic Reflection • Muropeng a"Afrika (PTY LTD) • Cradle of Humankind Trust	Board EXCO ARIC Chair	6 0 4
Prof M Cotton	Member	1 Nov 2016	n/a	MBChB (UCT), M.Med (Wits), PhD (Stell), FCPaed (SA), DTM&H (Wits), DCH (SA) Registered as specialist in Paediatric Infectious Diseases with HPCSA	Paediatric infectious diseases	• n/a	Board R&D	4 1
Ms N Kadwa	Member	1 Nov 2016	n/a	B. Proc Practicing attorney in South Africa; Member of KwaZulu-Natal Law Society; Appeared in the High and Constitutional Court of South Africa.	Administrative and Constitutional; Environmental and Property Law; Commercial and Corporate Law; Property Law Delivery of a vast number of opinions on varied aspects including property issues, e.g. lease, eviction, public liability and insurance, human resources, financial and tax obligations especially in relation to property disposition structuring, advices on brief with respect to policies and procedures. Chairing of disciplinary hearings, mediation on matters, Training and Workshops; Drafting, Reviewing, Vetting of Contracts Purchase and Sales as well as other dispositions such as cessions and donations Grant Agreements, Purchase and Sales of Movables (with Various specifications) Leases, assignments, cessions and other encumbrances CDA's & NDA's Corporate Financing Agreements including for a Corporate Financial lender Consultancy Agreements Memorandum of Understanding Material Transfer Agreements Intellectual Property Agreements	• Appeals Panel Member of EDTEA (Economic Development, Tourism and Environmental Affairs); • Trustee of Several Private Trusts	Board ARIC	6 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
Ms N Kadwa (continued)					Drafting as paper on Corporate governance in terms of NEMA, Drafting several appeal decision recommendations for Minister of EDTEA and his predecessors.			
Prof. E Bukusi	Member	1 Nov 2013	n/a	Certificate in International Health Postgraduate diploma in International Research Ethics Bachelor of Medicine and Bachelor of surgery Masters of Medicine in Obstetrics and Gynaecology Master of Public Health (Epidemiology) Masters in Bioethics (MBE) PhD in Epidemiology	Research focused on sexually transmitted infections, reproductive health, and HIV prevention, care and treatment Enhancing capacity to conduct socio-behavioural and biomedical research and provide HIV care through training and infrastructure development Research ethics and the development of systems and structures for regulation of research	• Member Board of Trustees, HIV Research Trust • UNAIDS Scientific Expert Panel • International Partnership for Microbicides • DSMB Advisory Panel • Reduction of Early Mortality Advisory Committee • AVAC • Multipurpose Prevention Technologies (MPT) • DSMB World Health Organization • Corticosteriods in pregnancy use study • Board of local NGO – IMPACT Research and Development organisation • Advisory board on the ATHENA network PrEP Preference study	Board R&D REMCO	5 1 1
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
Dr Z Kwitshana	Member	1 Nov 2013	n/a	Doctor of Philosophy (Immunology) Master of Medical Science Diploma Project Management National Higher Diploma Med Tech (Pathophys/ Immunology) Specialist Diploma Med.Tech. (Chemical Pathology) National Diploma Medical Technology (Clinical Pathology) MMed (Haem), clinical haematology subspecialist; Cert Clin Haem, Clinical haematology subspecialist; FCPath, Haematologist; MBBCh, Medical practitioner; BSc (Lab Med), Scientist	Immunological and nutritional impact of co-infection with HIV and neglected tropical diseases (Helminthiasis). Revitalising capacity in medical parasitology for national control of neglected tropical diseases Clinical Haematologist with special interest in haemostasis and thrombosis, clinical trials and other aspects of clinical and diagnostic haematology and pathology.	• Charles James Hospital Board • SA Immunology Society • International Journal of Maternal and Child Health and AIDS Editorial Board • National Schistosomiasis Review Working Group (Group Leader) • Mass Treatment Campaign Committee • Poliomyelitis Research Foundation Board. • WITS Health Consortium Board	Board EXCO REMCO	6 0 3
Prof J Mahlangu	Member	1 Nov 2016	n/a	MMed (Haem), clinical haematology subspecialist; Cert Clin Haem, Clinical haematology subspecialist; FCPath, Haematologist; MBBCh, Medical practitioner; BSc (Lab Med), Scientist	Clinical Haematologist with special interest in haemostasis and thrombosis, clinical trials and other aspects of clinical and diagnostic haematology and pathology.	• Poliomyelitis Research Foundation Board. • WITS Health Consortium Board	Board ARIC	3 2
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 ARIC	4 3
Prof B Shaw	Member	1 Nov 2016	n/a	D.Phil (Biokinetics); M.Phil (Biokinetics); B.A. Honours (Biokinetics) cum laude; B.A. Honours (Sport Science); B.A. (Humanities)	Exercise Science and Biokinetics: cardiopulmonary disease; non-communicable disease (NCD); hypokinetic disease	• Editorial board: ACSM's Health and Fitness Journal • Executive Director: Africa & Vice-President: Publications and Communication – International Physical Activity Projects (IPAP)	Board ARIC	6 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 R&D	5 1
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 EXCO REMCO	5 0 2
Prof S Velaphi	Member	1 Nov 2016	n/a	MBChB, MMed, FC Paed, Fellowship in Perinatal Neonatal Medicine	Neonatology	• Clothing Company for Church Clothes/Uniform	Board R&D	5 1

COMMITTEES: 1 NOVEMBER 2019 – 31 MARCH 2020

COMMITTEE	NO OF MEETINGS HELD	NO OF MEMBERS	NAME OF MEMBERS
Board	2	16	Prof J Mahlangu
			Prof L Zungu
			Dr Z Kwitshana
			Prof J Mahlangu
			Prof W Rae
			Prof B Shaw
			Prof L Skaal
			Prof T Sodi
			Prof S Velaphi
			Prof E Seekoe
			Prof E Mukwevho
			Prof C Dandara
			Prof T Tucker
			Prof R Carolissen
			Adv Khosa
			Ms June Williams
			Prof T Mavundla
			Dr M Madikizela
ARIC	1	5	Prof B Shaw
			Prof L Skaal
			Ms J Williams
			Prof T Mavundla
			Dr M Madikizela
RemCo	0	5	Prof T Sodi
			Prof L Zungu
			Prof T Tucker
			Prof R Carolissen
			Ms Khosa
R&D	0	5	Prof E Seekoe
			Prof E Mukwevho
			Prof C Dandara
			Prof. W Rae
			Prof S Velaphi

COMMITTEES: 1 APRIL 2019 – 31 OCTOBER 2019

COMMITTEE	NO OF MEETINGS HELD	NO OF MEMBERS	NAME OF MEMBERS
Board	6	15	Prof. M Sathekge
			Prof Q Abdool Karim
			Dr R Chikwamba
			Dr P Hanekom
			Prof M Cotton
			Ms N Kadwa
			Prof. E Bukusi
			Prof L Zungu
			Dr Z Kwitshana
			Prof J Mahlangu
			Prof W Rae
			Prof B Shaw
			Prof L Skaal
			Prof T Sodi
			Prof S Velaphi
ARIC	4	5	Dr P Hanekom
			Ms N Kadwa
			Prof J Mahlangu
			Prof W Rae
			Prof B Shaw
RemCo	3	5	Dr R Chikwamba
			Prof. E Bukusi
			Prof L Zungu
			Dr Z Kwitshana
			Prof T Sodi
R&D	2	6	Prof. M Sathekge
			Prof Q Abdool Karim
			Prof M Cotton
			Prof. E Bukusi
			Prof L Skaal
			Prof S Velaphi

ENTERPRISE RISK MANAGEMENT

The Board is ultimately accountable for the SAMRC's risk management processes and system of internal control. It has delegated responsibility to the Audit and Risk and IT Committee (ARIC) for overseeing and reviewing the efficacy of the:

- risk management processes and system of internal control;
- fraud prevention and information technology management as it relates to operational and financial reporting;
- internal auditor; and
- external auditor.

The Board receives regular updates on the activities of the ARIC and reports on its review in the organisation's Annual Report.

The objective of risk management in the SAMRC is to establish an integrated and effective risk management framework wherein important and emerging risks are identified, quantified and managed organisation wide. To this end the SAMRC has a dedicated Enterprise Risk Management (ERM) Unit that reports directly to the ARIC, and has established an ERM policy and framework which is based on COSO (Committee of Sponsoring Organisations of the Treadway Commission) Enterprise Risk Management – Integrated Framework 2017. The ERM framework defines the risk appetite, risk management objectives, methodology, risk identification, assessment and treatment processes and the responsibilities of the various risk management role-players in the organisation. During the year the ERM strategy, policy and framework, including the Risk Appetite and Tolerance Framework, designed to mitigate risks in line with the organisation's risk appetite statement, was reviewed and amendments were submitted to the ARIC for consideration and approved by the Board. An ERM software application is being implemented to support the SAMRC's risk management process.

The ERM Unit will continue to embed risk management principles and the methodology and continue with the implementation of a process to ensure follow-up by management of their risk intervention action plans to reduce the risk exposure to the SAMRC. 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.

PRINCIPAL RISKS & MITIGATION ACTIVITIES

The SAMRC's principal risks and opportunities are determined through a strategic risk review process where the SAMRC Executive Management and Board re-assess the key risks which could impact on the achievement of strategic objectives. Related risks are aggregated and grouped to determine the principal risks. The SAMRC's principal risk items (grouped by strategic priorities), the movement in risk during the reporting period, together with key measures taken to mitigate these risks, are listed on pages 174 -175.

STRATEGIC FOCUS AREA	PRINCIPAL RISK	SUMMARY DESCRIPTION OF RISK	KEY RESPONSE MEASURES
Administer health research effectively and efficiently in South Africa	Relationship between SAMRC and organised Labour	Deference in interpretation between SAMRC and Union on the collective agreement, union mandate and staff insourcing	• Standing monthly meetings with Union • Strengthened industrial relations within SAMRC • Union recognition agreement
	Inefficiencies in Corporate Processes	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
	Insufficient facility management, including movable and immovable assets	Infrastructure deterioration and aging buildings and research assets	• Asset management and verification • Capital project refurbishment • Revamping of office space in Ridge Road building
	Sustainability of the Defined Benefit (DB) fund	Market performance of investments below salary increase rates	• Freezing of increase in DB pensionable salary in excess of annual increase • Statutory actuarial valuation
	Business continuity programme	Lack of a broader SAMRC business continuity programme	• Comprehensive IT Business Continuity Programme • High IT dependency of identified critical business processes
	Inefficiencies in Research Processes	The risks of slow response times/ ineffective support by research support functions to assist research units in executing the SAMRC mandate	• Management oversight • Manual interventions • Policies, processes, SOPs
	Loss/theft of data	Cyberthreats and loss of SAMRC research data / intellectual property	• Firewall protection • Management monitoring and oversight • Policies, processes, SOPs
	Potential non-compliance to legal and regulatory requirements as well as policies and procedures	The risk involves failure to compliance with laws and regulations, including adverse changes, and failure of the control and oversight mechanisms	• Policies, guidelines and SOPs • Legal & Compliance Services • Occupational Health and Safety support

STRATEGIC FOCUS AREA	PRINCIPAL RISK	SUMMARY DESCRIPTION OF RISK	KEY RESPONSE MEASURES
Lead the generation of new knowledge and facilitate its translation into policies and practices to improve health	Poor research governance	The risk of poor oversight over research conducted, data protection and resource constraints	• Establish Research Integrity Office • Human and animal ethics committees • Policies, guidelines and SOPs
	Maintaining research integrity	The risk involves weak project scoping, poorly conducted research, application of inconsistent research methodology and inadequate mentorship	• External and internal quality review processes • Scientific advisory committees • Research Integrity Office • Oversight over the conduct of human and animal research
	Inferior quality of research output of extramural research units (EMUs)	Poor/fragmented management and oversight of extramural units and external/collaborative projects	• Approved EMU management strategy • Scientific Advisory Committees
	Transformation and diversity challenges	Progression of staff transformation across the organisation at senior research level impacted by various factors, including limited pool of public health scientists, behavioural scientist and medical clinical research scientists	• EE Strategy and Plan • Appointment of Intra-mural Unit Deputy Directors • Diversity intervention initiatives/ programs • Succession planning
	Inability to sustainably grow funding	Failure to appropriately utilise available funding to generate future funding opportunities	• Dedicated on-going investigation for further international funding opportunities
	Lack of research impact on strengthened policy and practice	Uncertainty about the extent to which the SAMRC can develop funding opportunities in the private sector	• SAMRC strategic and business plans in place • Oversight and leadership support by executive team • Ongoing guidance and training on research translation
Support innovation and technology development to improve health	Ineffective support for innovation, collaborative partnerships, platforms and technology development	The risk of researchers not understanding the policy and practice environment leading to poor funding decisions/ sub-optimally designed studies not meeting key stakeholder requirements	• Grant policy and procedures • IP Policy and strategy • Commercialisation plan • Spending model with long term return defined
	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 capacity for the long-term sustainability of the country's health research	Limited research capacity	Inattention to the strategic development of research scientists thus failing 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

INTERNAL CONTROL & ASSURANCE

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. To meet these responsibilities, the Board sets standards for internal control aimed at reducing the risk of error or loss in a cost-effective manner. As such, the organisation has implemented and maintained a number of internal control systems and governance structures to provide assurance on the status of governance and internal control, which is designed to ensure that risks are mitigated and that the SAMRC's objectives are attained. These include clearly defined and documented processes, policies approved by the Board, and monitoring mechanisms which ensures that appropriate actions are taken to correct deficiencies when identified.

The internal audit function is overseen by the Internal Audit Charter, which is reviewed and approved by the Board. The SAMRC makes use of an outsourced internal audit function and reports functionally to the ARIC. Internal audit reports independently to the ARIC and 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. The internal audit function is responsible for providing Executive Management and the Board with independent, objective assurance on the adequacy and effectiveness of the risk management, internal financial controls, the effectiveness of internal control over operational and compliance activities and governance processes across the SAMRC. Recommendations arising from internal audits are communicated to the relevant business areas and their implementation is tracked by the internal audit function. The ARIC receives regular reports on progress against the internal audit plan and corrective actions taken by management in response to internal audit findings. The internal audit function includes the provision of consulting services, which are designed to add value and improve the organisation's business systems.

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.

ETHICS AND INTEGRITY MANAGEMENT

The SAMRC's commitment to ethical standards 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 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. It is the responsibility of each employee to ensure that he/she complies with the provisions of the Code. In an event where an employee breaches the provisions of the policy, this will be addressed in terms of the SAMRC's Disciplinary and Grievance Policy.

The Code as well as a formal Gifts Policy also provides strict policies regarding gifts, invitations or favours received from suppliers or any other party. The offering of favours to gain unfair commercial advantages is also strictly prohibited.

The ARIC monitors compliance with the Code and addresses instances of fraud or irregularities. The SAMRC has an effective fraud prevention and detection process and ensures compliance and risk mitigation. No material investigations were concluded during the reporting period.

Each SAMRC employee is required to declare any interest and potential conflicts of interest on an annual basis via an on-line declaration of interest system. All outside work, financial and private interest, and any other business activities, including gifts, must be declared when completing the SAMRC staff annual On-line Declaration of Interest. Failure to disclose interests, or the wilful provision of incorrect or misleading details can lead to charges of misconduct.

The SAMRC has a zero tolerance to fraudulent behaviour 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.

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. Staff who have knowledge of an occurrence of fraud or corruption, or who have good reason to suspect that a fraudulent or corrupt act has occurred, have a duty to promptly report any reasonable suspicions. All reported cases are directed to the appropriate governance structures Fraud Prevention Plan and are treated with the utmost confidentiality to protect the rights of both the whistle blower and the alleged party.

SAMRC's MATERIALITY & SIGNIFICANCE FRAMEWORK: 2019/2020

The 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 and Minister of Finance (National Treasury) for approval (simultaneous submission).
b) participation in a significant partnership, trust, unincorporated joint venture or similar arrangement;	Qualifying transactions exceeds R12.5Mil (based on 2% of total average SAMRC assets, as at 31 March 2018). This includes research collaborative arrangements	
c) acquisition or disposal of a significant shareholding in a company;	Greater than 20% of shareholding.	

PFMA SECTION	QUANTITATIVE [AMOUNT]	QUALITATIVE [NATURE]
d) acquisition or disposal of a significant asset;	Qualifying transactions exceeds R12.5Mil (based on 2% of total average SAMRC assets, as at 31 March 2018). Including Financial Leases	Any asset that would increase or decrease the overall operational functions of the MRC, 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 R12.5Mil transaction value (based on 2% of total average SAMRC assets, as at 31 March 2018).	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 R12.5Mil (based on 2% of total SAMRC assets, as at 31 March 2018)	

SECTION 55: ANNUAL REPORT AND FINANCIAL STATEMENTS

3) 3) 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 Ac, 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 R12.5 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 parameters, the MRC materiality level calculation outcomes were as follows:

ELEMENT	% RAND TO BE APPLIED AGAINST R VALUE	ELEMENT VALUE AT 31 MARCH 2018	CALCULATED MATERIALITY & SIGNIFICANCE VALUE
Total Assets (1%-2%)	2%	R724 629 738	R14 492 595

The SAMRC materiality and significance value will be R12.5 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.

PART D

Human resources management

SAMRC ORGANOGRAM

SAMRC BOARD

PROF GLENDA E GRAY
SAMRC PRESIDENT AND CEO

PROF JEFFREY MPHAHLELE
VICE PRESIDENT

PROF RACHEL JEWKES
EXECUTIVE DIRECTOR
RESEARCH STRATEGY

PROF RICHARD GORDON
EXECUTIVE DIRECTOR
GRANTS, INNOVATION
AND PRODUCT
DEVELOPMENT

MR NICK BUICK
CHIEF FINANCIAL
OFFICER

MR BRINTON SPIES
EXECUTIVE DIRECTOR
HUMAN RESOURCES

MR MZIMHLE POPO
LEGAL COUNSEL

DR MONGEZI MDHLULI
CHIEF RESEARCH
OPERATIONS OFFICER

OVERVIEW

The goal of the Human Resources function remains to enable scientists and those who support research in the organization to have the necessary passion, aptitude, skills and experience to help the SAMRC deliver its mandate of funding and conducting research that improves the lives of all South Africans.

In this HR section, information on employment is provided which demonstrates how the HR function is translating the SAMRC's strategic priorities into action in order to contribute towards the mission of the SAMRC to create a better and healthier life for all South Africans. It provides evidence of what was achieved in 2019/20 in the areas of transformation, recruitment, organizational development (employment relations, career development and performance management) and human capacity development (through numerous study assistance and training programmes). The report addresses the implementation of the remuneration policy through career progression of staff that is fair, transparent and addresses issues of internal equity.

HR operates in close partnership with the executive management, unit directors and all divisions, and endeavors to assist the SAMRC and its employees to achieve the annual performance indicators.

HR PRIORITIES FOR THE YEAR UNDER REVIEW

The SAMRC's top priority during this period remained transformation and the organisation has continued to advance employees through career advancement and progression, accelerated development, study support and coaching of staff. The effective management of staff continued to be a focus area through the training of Managers in Employee Relations, Recruitment and the completion of formal Management skills training and development programmes.

With a concerted effort, HR prioritized improving its recruitment practice and turnaround times so that the appropriate skills are attracted and appointed to the organisation. Performance management remained an ongoing priority, including a process of moderation of performance results to ensure the alignment of individual performance scores with the business entities and organisational performances.

As the relationship with organised labour is critical, there is ongoing engagement with the trade union, and there are high levels of co-operation between Management and the Union.

The wellness of employees is important, and the focus of the wellness programme in collaboration with the Transformation forum has been broadened with emphasis on smaller groups, diversity training, debriefing sessions, disability awareness and regular awareness programmes in support of national health days. The SAMRC embarked on a three-year coaching strategy to support the Executive Management Committee, Unit Directors and Divisional Managers.

EMPLOYEE PERFORMANCE MANAGEMENT FRAMEWORK

The SAMRC has ensured that all employees have performance contracts in place. At least one mid-year formal performance discussions were held with employees and year-end reviews were conducted between managers and their reportees. Performance management results were used to inform corrective behaviour, career advancement and the payment of bonuses. A moderation process is used to ensure statistical alignment of scores and to ensure consistency in the application of performance management across the organisation. HR has also continued to train managers on the management of poor performance in order to facilitate a culture of corrective behaviour as far as possible using alternate dispute resolution in managing any potential conflicts in the workplace.

The organisation has developed career progression criteria for Scientists, Statisticians Project Leaders and Research Clinicians, which provided clear career development opportunities for employees. The SAMRC has continued to implement a process of career progression and advancement for employees during 2019/20.

EMPLOYEE WELLNESS PROGRAMME

The employee assistance programme provides for individual counselling, trauma debriefing, HIV and chronic disease management, life management and work-related issues, management assistance, Ill health, incapacity and absenteeism management. During the past year, the utilisation of the Employee Wellness Programme improved due to ongoing marketing of and exposure to the programme. The Wellness Days held in Cape Town, Pretoria and Durban were very well attended. More employees contacted the call centre, and teams requested trauma debriefing sessions when needed. The focus of the Programme has been broadened with emphasis on smaller groups, diversity training, debriefing sessions, disability awareness, and regular awareness programmes in support of national health days.

ACHIEVEMENTS FOR THE YEAR UNDER REVIEW

A group of Managers have been trained on how to chair a formal disciplinary hearing. As a result, the fairness of disciplinary processes has improved due to the proficiency levels of the Chairperson.

The utilisation of the Employee Wellness Programme improved due to ongoing marketing of and exposure to the programme. Wellness days were held in Cape Town, Pretoria and Durban.

The Career Progression and Advancement processes continued, and a further 60 staff were successful in their application for advancement to a next job level. This opportunity has an ongoing impact on staff motivation. Simultaneously, a career path for Research Clinicians has been developed, which assisted with the advancement and retention of employees in this category of scarce skills.

The relationship with the Union is sound and co-operative. The Union is involved in many of the HR processes, including representation on committees evaluating career progression and advancement and moderation of performance results, with observer status on recruitment panels. Regular meetings with labour were held to discuss matters of importance and mutual interest.

Salary negotiations for 2019/20 resulted in a settlement for annual salary increases well within the approved budget. Payment of 2018/19 performance bonuses was implemented whilst still remaining within the approved quantum. The SAMRC refreshed its salary ranges in compliance with the Remuneration Policy.

TRANSFORMATION

To address succession and transformation, we are continuing with the appointment of Deputy Director posts.

Internal capacity development initiatives continue to grow intramural scientific critical mass through the funding of Masters and PhD students and the provision of Post-doctoral development opportunities.

As part of the Transformation programme, the SAMRC conducted Gender Based Violence workshops as well as continued with the Diversity workshops for all staff. Disability Awareness Talks were also arranged across all regions to empower staff with regards to Disability.

Organisational transformation targets were further improved. There is still a need to appoint more Africans to the Senior Management cadre. The need for developing a pipeline and appointing more Specialist Scientists as well as Chief Specialists Scientists was identified and is continuously being actioned.

CHALLENGES FACED

There is a need to develop career development criteria for research and corporate support job categories in order to provide them with clearer career paths and a mechanism for advancement within the organisation.

An on-going challenge is responding to staff's need for security of employment whilst balancing the organisation's need to carefully manage its headcount. This means a move toward longer term contract appointments.

Transformation (including Diversity) is an on-going challenge for the SAMRC particularly at the Senior Management level.

There is a need to incentivise excellent performance. The current bonus budget available for this purpose seems to be insufficient to do so, and the criteria for payment of bonuses does not support rewarding excellence.

The restrictions imposed by National Treasury on salary increases for staff earning above R1 million per annum.

FUTURE HR PLANS AND GOALS

The organisation will continue refining its Performance Management System paying particular attention to embedding a culture of on-going performance discussions and focusing on the development of employees to enable them to improve their performance. In addition, a clear strategy to manage poor performance must become a focus area.

HR will continue to focus on Transformation within the SAMRC. The goal will be to appoint more women to senior leadership positions. Together with the Transformation Forum, a Transformation Plan for Corporate Support will be developed. Diversity workshops have been scheduled to take place across all regions within the organisation. A B-BBEE Specialist will also be appointed to assist with improving the organisation's scorecard.

Training has been scheduled to train a core group of employees to present at a formal disciplinary hearing on behalf of the SAMRC in order to ensure that the outcome of such a process is fair in terms of process and reason.

There is a need to migrate to a new Human Resource Information System (HRIS), and to ensure that the SAMRC adopts a new HRIS which will enable greater effectiveness and efficiencies in reporting and data management. A service provider has been appointed via a tender process, and progress has been made towards implementation during 2020.

HUMAN RESOURCE OVERSIGHT STATISTICS

GUARANTEED REMUNERATION

Table 1 below summarises the final audited expenditure on personnel costs by salary band. (occupational category)

Table 1: Personnel costs by salary band (occupational category), 2019/20

SALARY BAND	SAMRC EQUIVALENT OCCUPATIONAL CATEGORY	PERSONNEL EXPENDITURE (R)	% OF TOTAL GUARANTEED REMUNERATION COST	AVERAGE PERSONNEL COST PER EMPLOYEE (R)
Lower skilled (Levels 1-2)	Unskilled and defined decision making (Paterson A)	4,665,547.00	1.4	126,095.86
Skilled (Levels 3-5)	Semi-skilled & discretionary decision making (Paterson B)	18,815,960.00	5.5	179,199.62
Highly skilled production (Levels 6-8)	Skilled technical & academically qualified (Paterson C)	95,988,648.00	28.2	379,401.77
Highly skilled supervision (Levels 9-12)	Professionally qualified & specialists (Paterson D)	136,947,547.00	40.3	778,111.06
Senior management (Levels 13-16)	Senior Management (Paterson E & F)	83,560,939.00	24.6	1,465,981.39
Total		339,978,641.00	100.0	2,928,789.70

Table 2: Salaries (Guaranteed Pay) and overtime, by Occupational Category, 2019/20

SALARY BAND	SAMRC EQUIVALENT OCCUPATIONAL CATEGORY	SALARIES		OVERTIME	
		Amount (R)	Salaries as a % of personnel cost	Amount (R)	Overtime as a % of personnel cost
Lower skilled (Levels 1-2)	Unskilled and defined decision making (Paterson A)	4,665,547.00	1.4	61,253.43	0.02
Skilled (Levels 3-5)	Semi-skilled & discretionary decision making (Paterson B)	18,815,960.00	5.5	245,682.22	0.07
Highly skilled production (Levels 6-8)	Skilled technical & academically qualified (Paterson C)	95,988,648.00	28.2	517,310.98	0.15
Highly skilled supervision (Levels 9-12)	Professionally qualified & specialists (Paterson D)	136,947,547.00	40.3	25,278.37	0.01
Senior management (Levels 13-16)	Senior Management (Paterson E & F)	83,560,939.00	24.6	0.00	0.00
Total		339,978,641.00	100.00	849,525	0.25

Note: The SAMRC provides a total cost to company package. Therefore, housing and medical aid subsidy are included in the total cost to company package, and not reported separately. However, the SAMRC pays a medical allowance of R500 per month to employees earning less than R178 200 during the reporting period. The employee should be the principal member of a medical scheme to qualify.

EMPLOYMENT AND VACANCIES

The following table summarises the number of posts on the establishment, the number of employees and the vacancy rate.

Table 3: Employment and vacancies by occupational categories, 31 March 2020 (includes permanent and contract staff)

SALARY BAND	SAMRC EQUIVALENT OCCUPATIONAL CATEGORY	NUMBER OF POSTS	NUMBER OF POSTS FILLED	NO OF VACANCIES	BASELINE FUNDED (PERMANENT, INDEFINITE AND TERM BASELINE)	CONTRACT FUNDED	FLAGSHIP	VACANCY RATE (%) (NO OF VACANCIES/NO OF POSTS X 100)
Lower skilled (Levels 1-2)	Unskilled and defined decision making (Paterson A)	41	37	4	37	0	0	9.8
Skilled (Levels 3-5)	Semi-skilled & discretionary decision making (Paterson B)	106	105	1	31	74	0	0.9
Highly skilled production (Levels 6-8)	Skilled technical & academically qualified (Paterson C)	259	253	6	136	117	0	2.3
Highly skilled supervision (Levels 9-12)	Professionally qualified & specialists (Paterson D)	191	176	15	120	53	3	7.9
Senior management (Levels 13-16)	Senior Management (Paterson E & F)	65	57	8	54	3	0	12.3
TOTAL		662	628	34	378	247	3	5.1

JOB EVALUATION

Table 4 below summarises the number of jobs that were evaluated (graded) during the year under review. The table also provides statistics on the number of posts that were upgraded or downgraded.

Table 4: Job evaluation, 1 April 2019 to 31 March 2020

SALARY BAND	SAMRC EQUIVALENT OCCUPATIONAL CATEGORY	NUMBER OF POSTS	NUMBER OF JOBS EVALUATED	% OF POSTS EVALUATED BY SALARY BANDS	POSTS UPGRADED		POSTS DOWNGRADED	
					Number	% of total posts upgraded	Number	% of total posts downgraded
Lower skilled (Levels 1-2)	Unskilled and defined decision making (Paterson A)	37	4	10.8	2	3.3	0	0
Skilled (Levels 3-5)	Semi-skilled & discretionary decision making (Paterson B)	105	4	3.8	3	5.0	0	0
Highly skilled production (Levels 6-8)	Skilled technical & academically qualified (Paterson C)	253	31	12.3	24	40.0	0	0
Highly skilled supervision (Levels 9-12)	Professionally qualified & specialists (Paterson D)	176	46	26.1	25	41.7	0	0
Senior management	Senior Management (Paterson E & F)	57	10	17.5	6	10.0	0	0
Total		628	95	15.1	60	100	0	0

Note: Posts evaluated were for both promotions (career progression and advancement) and recruitment (new posts). Therefore, not all posts qualify to be considered for up- or downgrading.

Table 5: Career Progression and Advancement by salary band (occupational category)

SALARY BAND	SAMRC EQUIVALENT OCCUPATIONAL CATEGORY	NO OF EMPLOYEES	CAREER PROGRESSION AND ADVANCEMENT TO ANOTHER SALARY LEVEL	SALARY BANDS CAREER PROGRESSION AND ADVANCEMENT AS A % OF EMPLOYEES BY SALARY LEVEL
Lower skilled (Levels 1-2)	Unskilled and defined decision making (Paterson A)	37	2	5.4
Skilled (Levels 3-5)	Semi-skilled & discretionary decision making (Paterson B)	105	1	1.0
Highly skilled production (Levels 6-8)	Skilled technical & academically qualified (Paterson C)	253	22	8.7
Highly skilled supervision (Levels 9-12)	Professionally qualified & specialists (Paterson D)	175	25	14.3
Senior management	Senior Management (Paterson E & F)	57	10	17.5
Total		628	60	9.6

Note:

1. The SAMRC has moved away from reference to promotions, to be replaced by career progression and advancement.
2. The SAMRC does not have a system of notch progressions. Salary adjustments in the event of promotions (career progression or advancement) are calculated as per the criteria in the Remuneration Policy.
3. Number of employees promoted as on 31 March 2020.

Table 6 below provides a summary of the number of employees whose salary positions were upgraded due to their posts being upgraded. The number of employees might differ from the number of posts upgraded since not all employees are automatically absorbed into the new posts and some of the posts upgraded could also be vacant or new posts.

Table 6: Profile of employees whose salary positions were upgraded due to their posts being upgraded, 1 April 2019 to 31 March 2020

BENEFICIARIES	AFRICAN	INDIAN	COLOURED	WHITE	TOTAL
Female	14	5	18	5	42
Male	5	2	9	2	18
Total	19	7	27	7	60
Employees with a disability					2

Note: People with disabilities are included under race and gender above.

The following table summarises the number of cases where remuneration levels exceeded the grade determined by job evaluation. Reasons for the deviation are provided in each case.

Table 7: Employees whose salary level exceed the grade determined by job evaluation, 1 April 2019 to 31 March 2020

Total number of employees whose salaries exceeded the grades determined by job evaluation in 2019/20	0

EMPLOYMENT CHANGES

Turnover rates provide an indication of trends in the employment profile of the organisation. Table 8 below provides a summary of turnover rates by salary band.

Table 8: Annual turnover rates by salary band (occupational category), 1 April 2019 to 31 March 2020

SALARY BAND	SAMRC EQUIVALENT OCCUPATIONAL CATEGORY	NUMBER OF EMPLOYEES PER BAND	APPOINTMENTS INTO THE ORGANISATION	TERMINATIONS OUT OF THE ORGANISATION	TURNOVER RATE (%) = TERMINATIONS/ NUMBER OF EMPLOYEES PER BAND X 100
Lower skilled (Levels 1-2)	Unskilled and defined decision making (Paterson A)	37	18	1	2.7
Skilled (Levels 3)	Semi-skilled & discretionary decision making (Paterson B)	105	21	41	39.0
Highly skilled production (Levels 6-8)	Skilled technical & academically qualified (Paterson C)	253	21	43	17.0
Highly skilled supervision (Levels 9-12)	Professionally qualified & specialists (Paterson D)	176	32	24	13.6
Senior management	Senior Management (Paterson E & F)	57	1	5	8.8
TOTAL		628	93	114	18.2

Note: With reference to the turnover rate in Paterson B and C above, the majority of the employees that left the organisation were funded from contract funds. In addition, 45.6% was natural end of contract.

Table 9: Reasons why staff are leaving the organisation

TERMINATION TYPE	NUMBER OF TERMINATIONS	% OF TOTAL TERMINATIONS
Death	1	0.9
Resignation	52	45.6
Expiry of contract	52	45.6
Retrenchment– operational requirements	3	2.6
Dismissal: Misconduct	2	1.8
Poor performance	1	0.9
Discharged due to ill-health	0	0
Retirement	3	2.6
Transfers to other public service departments	0	0
Total	**114**	**100**
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**		18.2
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**		9.9

EMPLOYMENT EQUITY

All tables in this section are based on the formats prescribed by the Employment Equity Act, 55 of 1998.

Table 10: Total number of employees (including employees with disabilities) in each of the following occupational categories, 31 March 2020

OCCUPATIONAL CATEGORY	MALE				FEMALE				TOTAL
	African	Coloured	Indian	White	African	Coloured	Indian	White	
Legislators, senior officials and managers	7	5	4	13	2	7	4	15	**57**
Professionals	20	11	6	3	51	29	25	31	**176**
Technicians and associate professionals	30	27	12	3	94	49	32	6	**253**
Clerks	41	5	1	1	39	14	2	2	**105**
Service and sales workers	0	0	0	0	0	0	0	0	**0**
Skilled agriculture and fishery workers	0	0	0	0	0	0	0	0	**0**
Craft and related trades workers	0	0	0	0	0	0	0	0	**0**
Plant and machine operators and assemblers	0	0	0	0	0	0	0	0	**0**
Elementary occupations	8	3	0	0	16	10	0	0	**37**
Total	**106**	**51**	**23**	**20**	**202**	**109**	**63**	**54**	**628**
Employees with disabilities (included in above totals)	0	0	0	1	2	1	1	1	6

Table 11: Total number of employees (including employees with disabilities) in each of the following occupational levels, 31 March 2020

OCCUPATIONAL BAND	MALE				FEMALE				TOTAL
	African	Coloured	Indian	White	African	Coloured	Indian	White	
Top management	3	1	0	2	0	0	0	2	8
Senior management	4	4	4	11	2	7	4	13	49
Professionally qualified and experienced specialists and mid-management	20	11	6	3	51	29	25	31	176
Skilled technical and academically qualified workers, junior management, supervisors, foreman and superintendents	30	27	12	3	94	49	32	6	253
Semi-skilled and discretionary decision making	41	5	1	1	39	14	2	2	105
Unskilled and defined decision making	8	3	0	0	16	10	0	0	37
Total	106	51	23	20	202	109	63	54	628
Employees with disabilities (included in above totals)	0	0	0	1	2	1	1	1	6

Table 12: Recruitment (appointment of new employees), 1 April 2019 to 31 March 2020

OCCUPATIONAL BAND	MALE				FEMALE				TOTAL
	African	Coloured	Indian	White	African	Coloured	Indian	White	
Top management	0	0	0	0	0	0	0	0	0
Senior management	0	0	0	0	0	1	0	0	1
Professionally qualified and experienced specialists and mid-management	6	0	1	1	14	2	5	3	32
Skilled technical and academically qualified workers, junior management, supervisors, foreman and superintendents	3	2	1	0	13	1	1	0	21
Semi-skilled and discretionary decision making	9	0	0	0	8	4	0	0	21
Unskilled and defined decision making	1	0	0	0	11	6	0	0	18
Total	19	2	2	1	46	14	6	3	93
Employees with disabilities	0	0	0	0	1	0	1	0	0

Table 13: Career Progression and Advancement by race and gender, 1 April 2019 to 31 March 2020

Table 13 below provides similar information on career progression and advancements by race and gender to Table 5 above on promotions by salary band.

OCCUPATIONAL CATEGORY	MALE				FEMALE				TOTAL
	African	Coloured	Indian	White	African	Coloured	Indian	White	
Lower skilled (Levels 1-2) – Pat A	1	1	0	0	0	0	0	0	2
Skilled (Levels 3-5) – Pat B	0	0	0	0	0	1	0	0	1
Highly skilled production – Pat C (Levels 6-8)	1	4	1	0	6	7	3	0	22
Highly skilled supervision (Levels 9-12) – Pat D	2	2	1	1	7	7	2	3	25
Senior management – Pat E & F	1	2	0	1	1	3	0	2	10
Total	5	9	2	2	14	18	5	5	60
Employees with disabilities	0	0	0	1	0	0	0	1	2

Note: Employees with disabilities are included in the table above

Table 14 below details all staff exiting the organisation for any of the reasons identified in table 9 above.

Table 14: Exits by race and gender, 1 April 2019 to 31 March 2020

OCCUPATIONAL BAND	MALE				FEMALE				TOTAL
	African	Coloured	Indian	White	African	Coloured	Indian	White	
Top management	0	0	0	0	0	0	0	0	0
Senior management	0	0	1	1	0	0	1	2	5
Professionally qualified and experienced specialists and mid-management	7	0	0	0	8	0	5	4	24
Skilled technical and academically qualified workers, junior management, supervisors, foreman and superintendents	5	0	1	0	28	2	5	2	43
Semi-skilled and discretionary decision making	5	4	0	0	26	6	0	0	41
Unskilled and defined decision making	1	0	0	0	0	0	0	0	1
Total	18	4	2	1	62	8	11	8	114
Employees with disabilities	0	0	0	0	0	0	0	1	0

Table 15: Disciplinary action considered by a formal disciplinary hearing, 1 April 2019 to 31 March 2020

	MALE				FEMALE				TOTAL
	African	Coloured	Indian	White	African	Coloured	Indian	White	
Disciplinary action	1	0	0	0	0	0	2	0	3

Table 16: Skills development, 1 April 2019 to 31 March 2020

The table below refers to all staff who are in receipt of SAMRC bursary assistance and attendance at training.

OCCUPATIONAL CATEGORY	MALE				FEMALE				TOTAL
	African	Coloured	Indian	White	African	Coloured	Indian	White	
Legislators, senior officials and managers	0	1	0	3	0	5	2	1	12
Professionals	5	0	2	0	18	7	14	7	53
Technicians and associate professionals	9	9	7	0	58	8	33	1	125
Clerks	28	0	0	0	24	1	0	0	53
Service and sales workers	0	0	0	0	0	0	0	0	0
Skilled agriculture and fishery workers	0	0	0	0	0	0	0	0	0
Craft and related trades workers	0	0	0	0	0	0	0	0	0
Plant and machine operators and assemblers	0	0	0	0	0	0	0	0	0
Elementary occupations	0	0	0	0	0	0	0	0	0
Total	42	10	9	3	100	21	49	9	243
Employees with disabilities (included above)	0	0	0	0	0	0	0	0	0

PERFORMANCE REWARDS

To encourage performance, the organisation has granted the following performance bonuses during the year under review. Table 17 presents performance rewards by race, gender, and disability while Table 18 presents the performance bonus awarded by salary bands.

Table 17: Performance Bonus by race, gender, and disability, 1 April 2019 to 31 March 2020

	BENEFICIARY PROFILE			COST	
	NUMBER OF BENEFICIARIES	TOTAL NUMBER OF EMPLOYEES IN GROUP	% OF TOTAL WITHIN GROUP	COST (R)	AVERAGE COST PER EMPLOYEE (R) (BENEFICIARIES)
African	167	308	54.2	1,631,874.00	9,771.70
Male	53	106	50.0	586,843.00	11, 072.51
Female	114	202	56.4	1,045,031.00	9,166.94
Indian	54	86	62.8	689,302.00	12,764.85
Male	15	23	65.2	209,887.00	13,992.47
Female	39	63	61.9	479,415.00	12,292.69
Coloured	100	160	62.5	1,201,934.00	12,019.34
Male	30	51	58.8	385,256.00	12,841.87
Female	70	109	64.2	816,678.00	11,666.83
White	60	74	81.1	1,283,027.00	21,383.78
Male	16	20	80.0	446,583.00	27,911.44
Female	44	54	81.5	836,444.00	19,010.09
Employees with a disability (included in above table)					
Total	381	628	60.7	4,806,137.00	12,614.53

Table 18: Performance Bonus by salary band (occupational category) for personnel below Senior Management Service, 1 April 2019 to 31 March 2020

SALARY BAND	SAMRC EQUIVALENT OCCUPATIONAL CATEGORY	BENEFICIARY PROFILE			COST		
		Number of beneficiaries	Number of employees	% of total within salary bands	Total cost (R)	Average cost per employee/ beneficiary (R)	Total cost as a % of the total personnel expenditure in the band
Lower skilled (Levels 1-2)	Unskilled and defined decision making (Paterson A)	12	37	32.4	42,956.00	3,579.67	0.9
Skilled (Levels 3-5)	Semi-skilled & discretionary decision making (Paterson B)	57	105	54.3	207,127.00	3,633.81	1.1
Highly skilled production (Levels 6-8)	Skilled technical & academically qualified (Paterson C)	145	253	57.3	1,119,443.00	7,720.30	1.2
Highly skilled supervision (Levels 9-12)	Professionally qualified & specialists (Paterson D)	118	176	67.1	1,835,903.00	15,558.50	1.3
Total		332	571	58.1	3,205,429.00	9,654.91	1.3

Note: Average costs per employee based on beneficiaries in the various groups

Table 19: Performance related rewards (cash bonus), by salary band, for Senior Management

SALARY BAND	BENEFICIARY PROFILE			TOTAL COST (R)	AVERAGE COST PER EMPLOYEE (R)	TOTAL COST AS A % OF THE TOTAL PERSONNEL EXPENDITURE
	Number of beneficiaries	Number of employees	% of total within band			
Senior Management Band E&F	49	57	86.0	1,600,708.00	32,668.00	1.9
Total Snr Mgmt only	49	57	86.0	1,600,708.00	32,668.00	1.9

Note: Average cost per employee based on beneficiaries in the group

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 workers in each salary band and by each major occupation.

Table 20: Foreign workers, 1 April 2019 to 31 March 2020, by salary band (Occupational category)

SALARY BANDS	SAMRC EQUIVALENT OCCUPATIONAL CATEGORY	1 APRIL 2019		31 MARCH 2020		CHANGE	
		Number	% of total no of employees (639)	Number	% of total no of employees (628)	Number	% change
Lower skilled (Levels 1-2)	Unskilled and defined decision making (Paterson A)	0	0.0	0	0.0	0	0.0
Skilled (Levels 3-5)	Semi-skilled & discretionary decision making (Paterson B)	2	0.3	3	0.5	1	0.2
Highly skilled production (Levels 6-8)	Skilled technical & academically qualified (Paterson C)	2	0.3	2	0.3	0	0.0
Highly skilled supervision (Levels 9-12)	Professionally qualified & specialists (Paterson D)	22	3.4	18	2.9	-4	-0.6
Senior management (Levels 13-16)	Senior Management (Paterson E & F)	5	0.8	6	1.0	1	0.2
Total		31	4.9	29	4.6	-2	-0.3

Table 21: Foreign workers, 1 April 2019 to 31 March 2020, by major occupation or job title

MAJOR OCCUPATION/ JOB TITLE	1 APRIL 2019		31 MARCH 2020		CHANGE	
	Number	% of total no of employees (639)	Number	% of total no of employees (628)	Number	% change (March 2020 minus April 2019)
Unit Director	3	0.5	3	0.5	0	0.0
Chief Specialist Scientist	1	0.2	1	0.2	0	0.0
Senior Specialist Scientist	1	0.2	2	0.3	1	0.2
Specialist Scientist	9	1.4	8	1.3	-1	-0.1
Senior Scientist	8	1.3	6	1.0	-2	-0.3
Senior Data Manager	0	0.0	1	0.2	1	0.2
Senior Data Scientist	0	0.0	1	0.2	1	0.2
Research Support Manager	1	0.2	0	0.0	-1	-0.2
Research Manager	1	0.2	1	0.2	0	0.0
Scientist	1	0.2	0	0.0	-1	-0.2
Chief Research Technologist	1	0.2	1	0.2	0	0.0
Division Manager	1	0.2	1	0.2	0	0.0
Senior Research Technician	0	0.0	1	0.2	1	0.2
Research Technologist	1	0.2	1	0.2	0	0.0
Project Manager	1	0.2	0	0.0	-1	-0.2
Pharmacist	1	0.2	1	0.2	0	0.0
Driver	1	0.2	1	0.2	0	0.0
Total	**31**	**4.9**	**29**	**4.6**	**-2**	**-0.3**

LEAVE UTILIZATION: 1 APRIL 2019 TO 31 MARCH 2020

The Public Service Commission identified the need for careful monitoring of sick leave within the Public Service. Table 22 below provides an indication of the use of sick leave while Table 23 depicts disability leave granted. In both cases, the cost of the leave is also provided.

Table 22: Sick leave, 1 April 2019 to 31 March 2020

SALARY BAND	SAMRC EQUIVALENT OCCUPATIONAL CATEGORY	TOTAL SICK LEAVE DAYS TAKEN	NO OF SICK LEAVE DAYS TAKEN REQUIRING A MEDICAL CERTIFICATE >2 DAYS	% DAYS WITH MEDICAL CERTIFICATION	NUMBER OF EMPLOYEES USING SICK LEAVE	NO OF EMPLOYEES PER BAND	% OF TOTAL EMPLOYEES USING SICK LEAVE	AVERAGE DAYS SICK LEAVE PER EMPLOYEE	ACTUAL COST (R)
Lower skilled (Levels 1-2)	Unskilled and defined decision making (Paterson A)	176	89	50.6	27	37	73.0	6.5	88,891.00
Skilled (Levels 3-5)	Semi-skilled & discretionary decision making (Paterson B)	526	198	37.6	84	105	80.0	6.3	389,493.00
Highly skilled production (Levels 6-8)	Skilled technical & academically qualified (Paterson C)	1,360	552	40.6	209	253	82.6	6.5	2,062,702.00
Highly skilled supervision (Levels 9-12)	Professionally qualified & specialists (Paterson D)	608	274	45.1	115	176	65.3	5.3	1,922,862.00
Senior management	Senior Management (Paterson E & F)	116	54	46.6	28	57	49.1	4.1	624,513.00
Total		2,786	1 167	41.9	463	628	73.7	6.0	5,088,461.00

Table 23: Disability leave (temporary and permanent), 1 April 2019 to 31 March 2020

SALARY BAND	SAMRC EQUIVALENT OCCUPATIONAL CATEGORY	TOTAL DAYS TAKEN	% DAYS WITH MEDICAL CERTIFICATION	NUMBER OF EMPLOYEES USING DISABILITY LEAVE	NO OF EMPLOYEES PER BAND	% OF TOTAL EMPLOYEES FOR THIS BAND USING DISABILITY LEAVE	AVERAGE DISABILITY LEAVE DAYS TAKEN PER EMPLOYEE (TOTAL DAYS TAKEN/NO EMPLS USING SICK LEAVE)	ACTUAL COST (R)
Lower skilled (Levels 1-2)	Unskilled and defined decision making (Paterson A)	0	0.0	0	37	0.0	0.0	0.00
Skilled (Levels 3-5)	Semi-skilled & discretionary decision making (Paterson B)	0	0.0	0	105	0.0	0.0	0.00
Highly skilled production (Levels 6-8)	Skilled technical & academically qualified (Paterson C)	14	100.0	1	253	0.4	14	19,588.00
Highly skilled supervision (Levels 9-12)	Professionally qualified & specialists (Paterson D)	179	100.0	3	176	1.7	59.7	697,142.00
Senior management	Senior Management (Paterson E & F)	0	0	0	57	0.0	0.0	0.00
Total		193	100.0	4	628	0.6	48.3	716,730.00

Note: Disability leave refers to special sick leave awarded for major incidents or illness in addition to normal sick leave allocation

Table 24 below summarises the utilisation of annual leave.

Table 24 Annual Leave, 1 April 2019 to 31 March 2020

SALARY BANDS	SAMRC EQUIVALENT OCCUPATIONAL CATEGORY	NO OF EMPLOYEES	TOTAL DAYS TAKEN	AVERAGE ANNUAL LEAVE DAYS TAKEN PER EMPLOYEE
Lower skilled (Levels 1-2)	Unskilled and defined decision making (Paterson A)	37	628	17.0
Skilled (Levels 3-5)	Semi-skilled & discretionary decision making (Paterson B)	105	1,671	15.9
Highly skilled production (Levels 6-8)	Skilled technical & academically qualified (Paterson C)	253	4,830	19.1
Highly skilled supervision (Levels 9-12)	Professionally qualified & specialists (Paterson D)	176	3,082	17.5
Senior management	Senior Management (Paterson E & F)	57	1,227	21.5
Total		628	11,438	18.2

Table 25: Forfeited leave, 1 April 2019 to 31 March 2020.

SALARY BANDS	SAMRC EQUIVALENT OCCUPATIONAL CATEGORY	NO OF EMPLOYEES WHO FORFEITED LEAVE	TOTAL DAYS OF LEAVE FORFEITED	AVERAGE NUMBER OF DAYS FORFEITED PER EMPLOYEE
Lower skilled (Levels 1-2)	Unskilled and defined decision making (Paterson A)	0	0	0
Skilled (Levels 3-5)	Semi-skilled & discretionary decision making (Paterson B)	0	0	0
Highly skilled production (Levels 6-8)	Skilled technical & academically qualified (Paterson C)	0	0	0
Highly skilled supervision (Levels 9-12)	Professionally qualified & specialists (Paterson D)	0	0	0
Senior management (Levels 13-16)	Senior Management (Paterson E & F)	0	0	0
Total		0	0	0

Note: The SAMRC does not have a capped leave category. All employees are required to use one cycle's leave allocation by December of the following year. Any accrued leave not taken is then forfeited. No employees forfeited leave during the reporting period.

The following table summarises payments made to employees as a result of leave that was not taken. At the SAMRC, leave is only paid out at termination of employment to a maximum of 20 days.

Table 26: Leave pay outs, 1 April 2019 to 31 March 2020

REASON	TOTAL AMOUNT (R'000)	NUMBER OF EMPLOYEES	AVERAGE PAYMENT PER EMPLOYEE
Terminations (all exits)	5,957,623.51	138	43,171.18
Total	5,957,623.51	138	43,171.18

Note: Leave is only being paid out at termination of employment to a maximum of 20 days per employee.

HIV AND AIDS & HEALTH PROMOTION PROGRAMMES (PART OF THE SAMRC EMPLOYEE WELLNESS PROGRAMME)

Table 27: Steps taken to reduce the risk of occupational exposure

UNITS/CATEGORIES OF EMPLOYEES IDENTIFIED TO BE AT HIGH RISK OF CONTRACTING HIV & RELATED DISEASES	KEY STEPS
None	

Table 28: Details of Health Promotion and HIV and AIDS Programmes (part of SAMRC Employee Wellness Programme)

QUESTION	YES	NO	DETAILS, IF YES
1. Has the department designated a member of the SMS to implement the provisions contained in Part VI E of Chapter 1 of the Public Service Regulations, 2001? If so, provide her/his name and position.	Y		The Executive Director of HR takes responsibility as part of the SAMRC Employee Wellness Programme
2. Does the department have a dedicated unit, or has it designated specific staff members to promote the health and well-being of your employees? If so, indicate the number of employees who are involved in this task and the annual budget that is available for this purpose.	Y		3 staff members from the SAMRC, in collaboration with the appointed service provider. Budget: R500 000 p.a.
3. Has the department introduced an Employee Assistance or Health Promotion Programme for your employees? If so, indicate the key elements/services of this Programme.	Y		24/7/365 Call Centre Employee assistance programme Trauma debriefing HIV and Chronic disease management Life management and work-related issues Wellness days Staff orientation and awareness programmes Management assistance and orientation Ill health, incapacity and absenteeism management
4. Has the department established (a) committee(s) as contemplated in Part VI E.5 (e) of Chapter 1 of the Public Service Regulations, 2001? If so, please provide the names of the members of the committee and the stakeholder(s) that they represent.	Y		There is a Committee consisting of staff members of the SAMRC, the appointed service provider (Alexander Forbes), the corporate supported medical scheme (Bestmed) and the SAMRC Health and Safety Manager
5. Has the department reviewed its employment policies and practices to ensure that these do not unfairly discriminate against employees on the basis of their HIV status? If so, list the employment policies/practices so reviewed.	Y		Performance Management Policy Recruitment Policy Transformation Strategy Remuneration Policy
6. Has the department introduced measures to protect HIV-positive employees or those perceived to be HIV-positive from discrimination? If so, list the key elements of these measures.	Y		No special measures have been formally introduced. It is part of the SAMRC general code of conduct to honour the Constitution, EE and LRA Acts and other legislation, including reference to non-discriminatory practises and conduct. The SAMRC subscribes to the principles of no unfair discrimination.

QUESTION	YES	NO	DETAILS, IF YES
7. Does the department encourage its employees to undergo Voluntary Counselling and Testing? If so, list the results that you have you achieved.	Y		Yes, as part of our Wellness day initiatives. The individual information remains confidential, but statistical feedback is that more than 60% of staff know their status. There are also employees formally registered on the HIV programme under the umbrella of the wellness programme.
8. Has the department developed measures/indicators to monitor & evaluate the impact of its health promotion programme? If so, list these measures/ indicators.	Y		One of the SLAs is to measure and monitor the impact of the Wellness Programme via regular reporting of statistics, as well to promote the programme through information sessions and training.

LABOUR RELATIONS

The following collective agreements were entered into with trade unions within the organisation.

Table 29: Collective agreements, 1 April 2019 to 31 March 2020

SUBJECT MATTER	DATE
2019/2020 salary adjustment agreement concluded	15 April 2019

The following table summarises the outcome of both formal and informal disciplinary processes conducted within the organisation for the year under review.

Table 30: Misconduct and disciplinary hearings finalised, 1 April 2019 to 31 March 2020

OUTCOME OF DISCIPLINARY HEARINGS	NUMBER
Correctional counselling	0
Verbal warning	3
Written warning	1
Final written warning	3
Suspended without pay	0
Fine	0
Demotion	0
Dismissal	2
Not guilty	1
Case withdrawn	0
Total	10

Table 31: Types of misconduct addressed at disciplinary hearings

TYPE OF MISCONDUCT	NUMBER OF STAFF
Improper conduct	4
Leaving work without permission	1
Coming to work under the influence of alcohol	1
Victimisation, harassment, abusive or inappropriate language, bringing organization in disrepute	1
Absence without permission	1
Dishonesty/Mismanagement of study funds	1
Dereliction of Duties	1
Total	10

Table 32: Grievances lodged, 1 April 2019 to 31 March 2020

	NUMBER
Number of grievances resolved	0
Number of grievances not resolved	0
Total number of grievances lodged	**0**

Table 33: Disputes lodged with CCMA, 1 April 2019 to 31 March 2020

	NUMBER
Number of disputes upheld	0
Number of disputes dismissed	1
Total number of disputes lodged	**1**

Table 34: Strike actions, 1 April 2019 to 31 March 2020

Total number of employees working days lost	0
Total cost (R) of working days lost	0
Amount (R) recovered as a result of no work no pay	0

Table 35: Precautionary suspensions, 1 April 2019 to 31 March 2020

Number of people suspended	3
Number of people whose suspension exceeded 30 days	2
Average number of days suspended	98
Cost (R) of suspensions	1,178,531.00

SKILLS DEVELOPMENT

This section highlights the efforts of the organisation with regard to skills development.

Table 36: Training needs identified, 1 April 2019 to 31 March 2020 (WSP)

OCCUPATIONAL CATEGORY	GENDER	NUMBER OF EMPLOYEES AS AT 1 APRIL 2019	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	25	0	5	0	5
	Male	28	0	2	3	5
Professionals	Female	130	0	7	35	42
	Male	33	0	2	0	2
Technicians and associate professionals	Female	194	0	85	0	85
	Male	76	0	20	0	20
Clerks	Female	85	0	10	0	10
	Male	46	0	23	0	23
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	9	0	0	0	0
	Male	13	0	0	0	0
Sub Total	Female	443	0	107	35	142
	Male	196	0	47	3	50
Total		639	0	154	38	192

Table 37: Training provided, 1 April 2019 to 31 March 2020

OCCUPATIONAL CATEGORY	GENDER	NUMBER OF EMPLOYEES AS AT 1 APRIL 2019	TRAINING PROVIDED WITHIN THE REPORTING PERIOD			
			Learnerships	Skills programmes & other short courses	Other forms of training	Total
Legislators, senior officials and managers	Female	25	0	4	2	6
	Male	28	0	3	2	5
Professionals	Female	130	0	130	110	240
	Male	33	0	23	11	34
Technicians and associate professionals	Female	194	0	63	212	275
	Male	76	0	31	76	107
Clerks	Female	85	0	220	135	355
	Male	46	0	57	74	131
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	9	0	0	0	0
	Male	13	0	0	0	0
Sub Total	Female	443	0	0	0	0
	Male	196	0	0	0	0
Total		639	0	531	622	1153

INJURY ON DUTY

The following tables provide basic information on injury on duty

Table 39: Injury on duty, 1 April 2019 to 31 March 2020

NATURE OF INJURY ON DUTY	NUMBER
Required basic medical attention only	7
Temporary total disablement	2
Permanent disablement	0
Fatal	0
Total	9

PART E

Financial information

INDEX

The reports and statements set out below comprise the annual financial statements presented to parliament:

	Page
Nature of business and Principal Activities	204
Report of the Chief Executive Officer & President	205
Report of the Auditor General to Parliament on the South African Medical Research Council	206
Annexure – Auditor General's Responsibility for the Audit	209
Accounting Authority's Responsibilities and Approval	210
Audit Committee Report	211
Statement of Financial Position	213
Statement of Financial Performance	214
Statement of Changes in Net Assets	215
Cash Flow Statement	216
Statement of Comparison of Budget and Actual Amounts	217
Accounting Policies	219
Notes to the Annual Financial Statements	240
The following supplementary information does not form part of the financial statements	
Detailed Income statement	274

NATURE OF BUSINESS AND PRINCIPAL ACTIVITIES

The South African Medical Research Council (SAMRC) is a schedule 3A public entity to the PFMA 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, development and technology transfer. SAMRC focus on the top ten causes of death and disability associated risk factors. SAMRC acquire the most accurate healthcare information and provide 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, Parowvalley, 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 3.7% to R1092 304 (R1 053 401). This consists of an increase in government grants of 9.9% to R 597 101 (R543 330) offset to some extent by a decrease in contract income of 2.9% to R495 203 (R510 071).

Operating expenses reflected a decrease of 0.7% to R1 103 131 (R1 110 909) mainly driven by a decline in collaborative research costs of 11.3% to R457 540 (R515 618) largely in line with the decline in contract income

This has resulted in an operating surplus R12 246 for the year compared to an operating deficit of R37 565 in 2018/19. A decrease in investment income of 5.5% to R32 630 (R34 547) due to a decline in interest rates and a decrease in the average balance of investments during the year under review resulted in a net surplus for the year of R 43 042 compared to a net deficit of R3 186 in 2018/19.

The organisation remains financially strong with accumulated reserves of R341 530 (R298 489).

Total assets have decreased by 12.5% to R674 862 (R770 853) due mainly to a decrease in cash and cash equivalents of R92 905 due to the funding of collaborative research and capital expenditure

Deferred income has decreased by R100 397 to R198 366 in line with the reduction in cash and cash equivalents.

The SAMRC generated a negative operating cashflow of R59 139 compared to a negative operating cash flow of R17 607 in the prior period due to an increase in grant payments.

Net cash flows from investing activities were negative due mainly to capital expenditure of R30 857 (R38 503).

The net impact of the above is a decrease of R92 905 in cash and cash equivalents compared to a decrease of R27 844 in the prior year.

SPENDING TRENDS

Employee related costs have increased by 8.8% to R402 747 (R370 045). Basic salary costs have increased by 5.6% to R225 980 (R214 054) and non-pensionable allowances by 6.9% to R 107 953 (R101 015) due to annual increases.

Employee related costs include a bonus provision of R5 137 (R4 982). Initiatives to manage the employer liabilities in relation to the Defined Benefit Pension fund and Post-Retirement Medical Aid have yielded results with a further reduction in these liabilities of R2 134 (R13 389) for the year.

The net surplus for the year of R43 042 compared to a final budget deficit of R6 829. Revenue was R15 780 over budget due to an increase in contract income resulting from earlier than anticipated research outputs as well as higher than anticipated conference income.

Personnel costs were R18 450 under budget due to vacant positions not filled as well as a decrease in the liability for the defined benefit pension fund. Depreciation was R9 145 under budget mainly due to the extension of the anticipated useful lives of some assets still in use.

Tight control of costs resulted in repairs and maintenance, travel and subsistence, printing and stationery and laboratory costs showing significant savings on budget. This facilitated the funding of additional research activities resulting in collaborative research costs of R7 549 over budget.

REQUESTS FOR ROLL OVER OF FUNDS

Accumulated reserves at 31 March 2020 amount to R341 530 (R298 489). The necessary approvals have been requested 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 existing Materiality Framework was approved by the Minister.

AUDIT REPORT MATTERS

There were no matters to report.

EVENTS AFTER THE REPORTING DATE

An assessment of the impact of the current Covid-19 pandemic on the carrying value of assets and the going concern status of the SAMRC has been performed. Details are disclosed in note 43 to the financial statements

ECONOMIC VIABILITY

Funding allocations of R621 790 for 2020/21 have been approved by government through the MTEF process. This together with accumulated reserves of R341 530 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 213 to 273, which comprise the statement of financial position as at 31 March 2020, statement of financial performance, statement of changes in net assets, cash flow statement and statement of comparison of budget information with actual information for the year then ended, as well as the 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 2020, and its financial performance and cash flows for the year then ended in accordance with the Standards of Generally Recognised Accounting Practice (Standards of GRAP) and the requirements of the Public Finance Management Act of South Africa, 1999 (Act No. 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 auditor-general's responsibilities for the audit of the financial statements section of this auditor's report.
4. I am independent of the public entity in accordance with sections 290 and 291 of the *Code of ethics for professional accountants* and parts 1 and 3 of the *International code of ethics for professional accountants* (including International Independence Standards) of the International Ethics Standards Board for Accountants (IESBA codes) as well as the 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 codes.
5. I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my opinion.

Emphasis of matter

6. I draw attention to the matter below. My opinion is not modified in respect of this matter.

Restatement of corresponding figures

7. As disclosed in note 41 to the financial statements, the corresponding figures for 31 March 2019 have been restated as a result of errors discovered during the 2019-20 financial year in the financial statements of the public entity at, and for the year ended, 31 March 2020.

Other matter

8. I draw attention to the matter below. My opinion is not modified in respect of this matter.

Unaudited supplementary schedules

9. The supplementary information set out on page 274 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 thereon.

Responsibilities of the accounting authority for the financial statements

10. The board, which constitutes the accounting authority, is responsible for the preparation and fair presentation of the financial statements in accordance with the Standards of 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.
11. In preparing the financial statements, the accounting authority is responsible for assessing the public 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 public entity or to cease operations, or has no realistic alternative but to do so.

REPORT OF THE AUDITOR-GENERAL TO PARLIAMENT ON THE SOUTH AFRICAN MEDICAL RESEARCH COUNCIL (CONTINUED)

Auditor-general's responsibilities for the audit of the financial statements

12. 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 financial statements.

13. 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

Introduction and scope

14. In accordance with the Public Audit Act of South Africa, 2004 (Act No. 25 of 2004) (PAA) and the general notice issued in terms thereof, I have a responsibility to report on the usefulness and reliability of the reported performance information against predetermined objectives for selected objectives presented in the annual performance report. I performed procedures to identify material findings but not to gather evidence to express assurance.

15. My procedures address the usefulness and reliability of the reported performance information, which must be based on the approved performance planning documents of the public entity. I have not evaluated the completeness and appropriateness of the performance indicators / measures included in the planning documents. My procedures do not examine whether the actions taken by the public entity enabled service delivery. My procedures also do not extend to any disclosures or assertions relating to planned performance strategies and information in respect of future periods that may be included as part of the reported performance information. Accordingly, my findings do not extend to these matters.

16. I evaluated the usefulness and reliability of the reported performance information in accordance with the criteria developed from the performance management and reporting framework, as defined in the general notice, for the following selected objectives presented in the annual performance report of the public entity for the year ended 31 March 2020:

STRATEGIC OBJECTIVES	PAGES IN THE ANNUAL PERFORMANCE REPORT
Strategic goal 2: lead the generation of new knowledge and facilitate its translation into policies and practices to improve health	26 – 27
Strategic goal 3: support innovation and technology development to improve health	28 – 29

17. I performed procedures to determine whether the reported performance information was properly presented and whether performance was consistent with the approved performance planning documents. I performed further procedures to determine whether the indicators and related targets were measurable and relevant, and assessed the reliability of the reported performance information to determine whether it was valid, accurate and complete.

18. I did not identify any material findings on the usefulness and reliability of the reported performance information for these objectives:
    - Strategic goal 2: lead the generation of new knowledge and facilitate its translation into policies and practices to improve health
    - Strategic goal 3: support innovation and technology development to improve health

REPORT OF THE AUDITOR-GENERAL TO PARLIAMENT ON THE SOUTH AFRICAN MEDICAL RESEARCH COUNCIL CONTINUED)

Other matter

19. I draw attention to the matter below.

Achievement of planned targets

20. Refer to the annual performance report on pages 26 to 29 for information on the achievement of planned targets for the year and explanations provided for the overachievement of a significant number of targets.

REPORT ON THE AUDIT OF COMPLIANCE WITH LEGISLATION

Introduction and scope

21. In accordance with the PAA and the general notice issued in terms thereof, I have a responsibility to report material findings on the public entity's compliance with specific matters in key legislation. I performed procedures to identify findings but not to gather evidence to express assurance.

22. I did not identify any material findings on compliance with the specific matters in key legislation set out in the general notice issued in terms of the PAA.

OTHER INFORMATION

23. The accounting authority is responsible for the other information. The other information does not include the financial statements, the auditor's report and those selected objectives presented in the annual performance report that have been specifically reported in this auditor's report.

24. My opinion on the financial statements and findings on the reported performance information and compliance with legislation do not cover the other information and I do not express an audit opinion or any form of assurance conclusion thereon.

25. In connection with my audit, my responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial statements and the selected objectives 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, reported performance information and compliance with applicable legislation; however, my objective was not to express any form of assurance on it. I did not identify any significant deficiencies in internal control.

Auditor-General

Cape Town

30 September 2020

AUDITOR-GENERAL SOUTH AFRICA

ANNEXURE – AUDITOR GENERAL'S RESPONSIBILITY FOR THE AUDIT

1. 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 objectives and on the public entity's compliance with respect to the selected subject matters.

Financial statements

2. 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 public entity's internal control
   - evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the board, which constitutes the accounting authority
   - conclude on the appropriateness of the use of the going concern basis of accounting by the board, which constitutes the accounting authority, 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 public 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 a public 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

3. 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.

4. I also confirm to the accounting authority that I have complied with relevant ethical requirements regarding independence, and communicate all relationships and other matters that may reasonably be thought to have a bearing on my independence and, where applicable, actions taken to eliminate threats or safeguards applied.

ACCOUNTING AUTHORITY'S RESPONSIBILITIES AND APPROVAL

The Accounting Authority is required by the Public Finance Management Act (Act1 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 Board 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 deficit 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 or deficit.

The Accounting Authority has reviewed the entity's cash flow forecast for the year ended 31 March 2021 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, it is supported by the entity's external auditors.

The external auditors are responsible for independently auditing and expressing an opinion 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 page 208.

The annual financial statements set out on pages 213 to 273, which have been prepared on the going concern basis, were approved by the Accounting Authority on 29 September 2020 and were signed on its behalf by:

Professor J Mahlangu
Chairperson of the Board

AUDIT COMMITTEE REPORT

We are pleased to present our report for the financial year ended March 31, 2020.

AUDIT COMMITTEE MEMBERS AND ATTENDANCE

The audit committee consists of the members listed hereunder and should meet 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 23 July 2020.

NAME OF MEMBER	NUMBER OF MEETINGS ATTENDED
Doctor P Hanekom (Chairperson till 31/10/2019)	4
Professor B Shaw (Chairperson from 1/11/2019 and 6 committee member till 31/10/2019)	6
Advocate N Kadwa (term ended 31/1/2019)	4
Doctor M Madikizela (appointment 1/11/2019)	2
Professor J Mahlangu (term ended 31/10/2019)	2
Professor T Mavundla (appointment 1/11/2019)	2
Professor W Rae (term ended 31/10/2019)	3
Professor L Skaal (appointment 01/11/2019)	2
Ms. J Williams (appointment 01/11/2019)	2

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 Accounting Authority of the entity during the year under review.

AUDIT COMMITTEE REPORT

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 the entity's compliance with legal and regulatory provisions.

The audit committee concurs with and accept the Auditor-General of South Africa's report on the annual financial statements, and are 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.

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

The IT infrastructure was upgraded during the year under review. BarnOwl Enterprise Risk Management software and certain modules of the Research Information Management Systems was implemented in the year under review.

Chairperson of the Audit Committee
Date: 28 September 2020

STATEMENT OF FINANCIAL POSITION AS AT MARCH 31, 2020

	NOTE(S)	2020 31 MARCH R	2019 RESTATED 31 MARCH R
Assets			
Current Assets			
Financial assets at fair value	3	5,558,744	6,968,351
Receivables from exchange transactions	4	63,357,217	89,082,829
Receivables from non-exchange transactions	5	2,281,053	–
VAT receivable	6	10,689,890	5,610,834
Prepayments	7	7,726,987	8,125,353
Cash and cash equivalents	8	370,461,853	463,366,711
		460,075,744	**573,154,078**
Non-Current Assets			
Biological assets that form part of an agricultural activity	9	1,137,538	1,307,270
Property, plant and equipment	10	198,249,751	183,717,574
Intangible assets	11	14,095,993	12,674,035
Investments in controlled entities	12	2	2
Employee benefit asset	16	1,303,000	–
		214,786,284	**197,698,881**
Total Assets		**674,862,028**	**770,852,959**
Liabilities			
Current Liabilities			
Payables from exchange transactions	13	110,417,000	141,671,152
Provisions	14	12,299,191	19,042,314
Deferred income	15	198,366,172	298,762,926
		321,082,363	**459,476,392**
Non-Current Liabilities			
Employee benefit obligation	16	7,964,000	8,795,000
Earmarked funds	17	4,285,170	4,093,058
		12,249,170	**12,888,058**
Total Liabilities		**333,331,533**	**472,364,450**
Net Assets		**341,530,495**	**298,488,509**
Accumulated surplus	18	341,530,495	298,488,509

STATEMENT OF FINANCIAL PERFORMANCE

	NOTE(S)	2020 31 MARCH R	2019 31 MARCH R
Revenue	19	1,092,304,846	1,053,401,277
Other income	20	23,072,669	19,942,395
Operating expenses	22	(1,103,131,032)	(1,110,908,565)
Operating surplus (deficit)	29	**12,246,483**	**(37,564,893)**
Investment income	21	32,630,015	34,547,490
Fair value adjustments	27	(1,565,659)	143,986
Finance costs	24	(268,853)	(313,018)
Surplus (Deficit) for the period		**43,041,986**	**(3,186,435)**

STATEMENT OF CHANGES IN NET ASSETS

	TOTAL NET ASSETS 31 MARCH R
Opening balance as previously reported	289,755,468
Adjustments	
Correction of errors	11,919,476
Balance at 1 April, 2018 as restated*	**301,674,944**
Changes in net assets	
Deficit for the 12 months ended	(3,186,435)
Total changes	(3,186,435)
Restated* Balance at 1 April, 2019	**298,488,509**
Changes in net assets	
Surplus for the 12 months ended	43,041,986
Total changes	43,041,986
Balance at 31 March, 2020	**341,530,495**

* See note 41

CASH FLOW STATEMENT

	NOTE(S)	2020 R	2019 R
Cash flows from operating activities			
Receipts			
Interest income	21	32,466,696	34,417,767
Dividends received	21	163,319	129,723
Cash receipts from grants and other income		1,033,744,631	1,066,964,077
		1,066,374,646	1,101,511,567
Payments			
Suppliers		(1,125,244,756)	(1,083,591,650)
Finance costs		(268,853)	(313,018)
		(1,125,513,609)	(1,083,904,668)
Net cash flows from operating activities	30	**(59,138,963)**	**17,606,899**
Cash flows from investing activities			
Purchase of property, plant and equipment	10	(30,856,560)	(38,503,465)
Proceeds from sale of property, plant and equipment		713,721	18,932
Purchase of other intangible assets	11	(3,984,900)	(7,242,762)
Purchase of biological assets that form part of an agricultural activity	9	(114,401)	(85,801)
Proceeds from sale of biological assets that form part of an agricultural activity	9	284,133	214,834
Net cash flows from investing activities		**(33,958,007)**	**(45,598,262)**
Cash flows from financing activities			
Movement in earmarked funds	17	192,112	146,906
Net (decrease) increase in cash and cash equivalents		**(92,904,858)**	**(27,844,457)**
Cash and cash equivalents at the beginning of the year		463,366,711	491,211,168
Cash and cash equivalents at the end of the period	8	**370,461,853**	**463,366,711**

An amount of R198,366,172 (March 2019 restated: R298,762,926, previously stated March 2019: R310,682,402) included in cash and cash equivalents is due to cash received from funders for research projects in progress or not yet commenced.

STATEMENT OF COMPARISON OF BUDGET AND ACTUAL AMOUNTS

BUDGET ON ACCRUAL BASIS

	APPROVED BUDGET 31 MARCH	ADJUSTMENTS 31 MARCH	FINAL BUDGET 31 MARCH	ACTUAL AMOUNTS ON COMPARABLE BASIS 31 MARCH	DIFFERENCE BETWEEN FINAL BUDGET AND ACTUAL 31 MARCH	REFERENCE
	R	R	R	R	R	R
Statement of Financial Performance						
Revenue						
Revenue from exchange transactions						
Income from contracts, grants and services rendered	355,611,630	131,635,186	**487,246,816**	423,552,011	**(63,694,805)**	40.1
Rental income	5,244,000	–	**5,244,000**	5,393,995	**149,995**	
Other income	7,756,000	(3,755,600)	**4,000,400**	12,693,257	**8,692,857**	40.3
Interest received – investment	30,650,000	3,000,000	**33,650,000**	32,466,696	**(1,183,304)**	40.13
Dividends received	–	–	**–**	163,319	**163,319**	
Total revenue from exchange transactions	**399,261,630**	**130,879,586**	**530,141,216**	**474,269,278**	**(55,871,938)**	
Revenue from non-exchange transactions						
Government grants & subsidies	597,101,270	(400)	**597,100,870**	597,100,870	**–**	
Income from contracts and grants (non-exchange)	–	–	**–**	71,651,965	**71,651,965**	40.1
Total revenue from non-exchange transactions	**597,101,270**	**(400)**	**597,100,870**	**668,752,835**	**71,651,965**	
Total revenue	**996,362,900**	**130,879,186**	**1,127,242,086**	**1,143,022,113**	**15,780,027**	

STATEMENT OF COMPARISON OF BUDGET AND ACTUAL AMOUNTS (CONTINUED)

BUDGET ON ACCRUAL BASIS	APPROVED BUDGET 31 MARCH	ADJUSTMENTS 31 MARCH	FINAL BUDGET 31 MARCH	ACTUAL AMOUNTS ON COMPARABLE BASIS 31 MARCH	DIFFERENCE BETWEEN FINAL BUDGET AND ACTUAL 31 MARCH	REFERENCE
	R	R	R	R	R	R
Expenditure						
Personnel	(392,363,737)	(28,833,006)	**(421,196,743)**	(402,746,555)	**18,450,188**	40.2
Infra-structural, communication & statutory costs	(34,190,999)	1,300,000	**(32,890,999)**	(36,186,248)	**(3,295,249)**	40.4
Depreciation and amortisation	(21,000,000)	(5,000,000)	**(26,000,000)**	(16,854,908)	**9,145,092**	40.9
Finance costs	–	–	**–**	(268,853)	**(268,853)**	
Lease rentals	(9,601,052)	2,500,000	**(7,101,052)**	(6,161,303)	**939,749**	
Debt Impairment/ (reversal)	–	–	**–**	(36,521)	**(36,521)**	
Bad debts written off	(1,000,000)	1,000,000	**–**	–	**–**	
Repairs and maintenance	(20,977,302)	2,000,000	**(18,977,302)**	(14,231,559)	**4,745,743**	40.5
Travel, subsistence and vehicle fleet costs	(43,145,160)	(7,354,840)	**(50,500,000)**	(46,863,307)	**3,636,693**	40.6
Collaborative research	(384,397,137)	(65,593,716)	**(449,990,853)**	(457,539,975)	**(7,549,122)**	40.7
External research support, consulting and internal audit	(15,551,815)	6,391,460	**(9,160,355)**	(7,974,091)	**1,186,264**	40.5
Printing, stationery and publication costs	(12,184,106)	1,448,624	**(10,735,482)**	(8,610,262)	**2,125,220**	40.5
Information technology	(26,458,831)	2,000,000	**(24,458,831)**	(24,139,990)	**318,841**	
Laboratory operating expenses	(41,757,091)	(14,000,000)	**(55,757,091)**	(53,346,659)	**2,410,432**	40.11
Other expenses	(13,262,292)	(11,737,708)	**(25,000,000)**	(24,334,313)	**665,687**	
Audit fees	(2,302,390)	–	**(2,302,390)**	(2,786,644)	**(484,254)**	
Total expenditure	**(1,018,191,912)**	**(115,879,186)**	**(1,134,071,098)**	**(1,102,081,188)**	**31,989,910**	
Operating surplus (deficit)	**(21,829,012)**	**15,000,000**	**(6,829,012)**	**40,940,925**	**47,769,937**	
Loss on disposal of assets	–	–	**–**	(1,318,697)	**(1,318,697)**	40.8
Gain on foreign exchange	–	–	**–**	4,985,417	**4,985,417**	40.10
Budget on Accrual Basis						
Fair value adjustments	–	–	**–**	(1,565,659)	**(1,565,659)**	40.12
	–	**–**	**–**	**2,101,061**	**2,101,061**	
Surplus (deficit) for the period	**(21,829,012)**	**15,000,000**	**(6,829,012)**	**43,041,986**	**49,870,998**	
Actual Amount on Comparable Basis as Presented in the Budget and Actual Comparative Statement	**(21,829,012)**	**15,000,000**	**(6,829,012)**	**43,041,986**	**49,870,998**	

The accounting policies on pages 219 to 239 and the notes on pages 240 to 273 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 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:

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 long-term debt. Other techniques, such as estimated discounted cash flows, are used to determine fair value for the remaining financial instruments. The fair value of interest rate swaps is calculated as the present value of the estimated future cash flows. The fair value of forward foreign exchange contracts is determined using quoted forward exchange rates at the end of the reporting period.

ACCOUNTING POLICIES (CONTINUED)

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 14 - 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.

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 16.

Useful lives of property, plant and equipment and Intangible assets

Management assess 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.

1.3 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.

Biological assets are measured at their fair value less costs to sell.

ACCOUNTING POLICIES (CONTINUED)

1.3 BIOLOGICAL ASSETS THAT FORM PART OF AN AGRICULTURAL ACTIVITY (CONTINUED)

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.

1.4 PROPERTY, PLANT AND EQUIPMENT

Property, plant and equipment are tangible non-current assets (including infrastructure assets and biological assets used for research) 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 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.

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.

ACCOUNTING POLICIES (CONTINUED)

1.4 PROPERTY, PLANT AND EQUIPMENT (CONTINUED)

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
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
Usufruct buildings	Straight line	over life of asset
Prefabricated buildings	Straight line	20 – 30 years
Water pipes	Straight line	20 – 30 years
Water meters	Straight line	10 – 15 years
Other property, plant and equipment – Biological assets – Vervet monkeys	Straight line	30 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; laboratory equipment and other property, plant and equipment – vervet monkeys 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 determine 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.

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).

ACCOUNTING POLICIES (CONTINUED)

1.5 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.

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).

1.6 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.

1.7 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.

ACCOUNTING POLICIES (CONTINUED)

1.7 FINANCIAL INSTRUMENTS (CONTINUED)

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.

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.

ACCOUNTING POLICIES (CONTINUED)

1.7 FINANCIAL INSTRUMENTS (CONTINUED)

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;
  - 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 measured at fair value
Unit trusts	Held for trading measured 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.

ACCOUNTING POLICIES (CONTINUED)

1.7 FINANCIAL INSTRUMENTS (CONTINUED)

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.

Impairment and uncollectibility 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.

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.

1.8 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).

1.9 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.

ACCOUNTING POLICIES (CONTINUED)

1.10 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.

1.11 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.

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 entity 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.

ACCOUNTING POLICIES (CONTINUED)

1.11 IMPAIRMENT OF NON-CASH-GENERATING ASSETS (CONTINUED)

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:

Restoration cost of restoring

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.

ACCOUNTING POLICIES (CONTINUED)

1.12 EMPLOYEE BENEFITS

Employee benefits are all forms of consideration given by SAMRC in exchange for service rendered by employees. An annual valuation of the MRC Pension Fund and Post Retirement Medical Aid is performed.

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.

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 recognise 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.

ACCOUNTING POLICIES (CONTINUED)

1.12 EMPLOYEE BENEFITS (CONTINUED)

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 recognise 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 recognise 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.

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.

ACCOUNTING POLICIES (CONTINUED)

1.12 EMPLOYEE BENEFITS (CONTINUED)

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 determine 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.

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.

ACCOUNTING POLICIES (CONTINUED)

1.12 EMPLOYEE BENEFITS (CONTINUED)

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.

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.

ACCOUNTING POLICIES (CONTINUED)

1.12 EMPLOYEE BENEFITS (CONTINUED)

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.

1.13 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.

ACCOUNTING POLICIES (CONTINUED)

1.13 PROVISIONS AND CONTINGENCIES (CONTINUED)

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 33.

1.14 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 or social security benefit commitments are excluded.

1.15 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 text books and sale of biological assets are classified as sale of goods.

ACCOUNTING POLICIES (CONTINUED)

1.15 REVENUE FROM EXCHANGE TRANSACTIONS (CONTINUED)

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.

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.

1.16 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.

ACCOUNTING POLICIES (CONTINUED)

1.16 REVENUE FROM NON-EXCHANGE TRANSACTIONS (CONTINUED)

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.

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 discloses the nature and type of services in-kind received during the reporting period.

1.17 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.

ACCOUNTING POLICIES (CONTINUED)

1.17 REVENUE RECOGNITION FOR EXCHANGE AND NON-EXCHANGE TRANSACTIONS (CONTINUED)

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.

Deferred income

Deferred income is recognised as revenue to the extent that expenses are incurred and that conditions of the grant are met.

1.18 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.

1.19 TRANSLATION OF FOREIGN CURRENCIES

Foreign currency transactions

A foreign currency transaction is recorded, on initial recognition in Rands, 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.

1.20 VAT

The SAMRC accounts for VAT on the invoice basis.

1.21 COMPARATIVE FIGURES

Where necessary, comparative figures have been reclassified to conform to changes in presentation in the current year.

ACCOUNTING POLICIES (CONTINUED)

1.22 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.3 of 2019/2020 which was issued in terms of sections 76(2)(e) to 76(4)(a) of the PFMA (effective from 1 November 2019).

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; where appropriate raise a debt. Fruitless and wasteful expenditure is reported monthly to National Treasury and quarterly to the Board.

1.23 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. 2 of 2019/2020 which was issued in terms of sections 76(1) to 76(4) 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 financial statements.

Irregular expenditure that was incurred and identified during the current financial year and for which condonement is being awaited at year end must be recorded in the irregular expenditure register. No further action is required with the exception of updating the note to the financial statements.

Where irregular expenditure was incurred in the previous financial year and is only condoned in the following financial year, the register and the disclosure note to the financial statements will be updated with the amount condoned.

Irregular expenditure written off by the Board is submitted to National Treasury for condonation.

Irregular expenditure that was incurred and identified during the current financial year and which was not condoned by the National Treasury or the relevant authority 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 relevant note to the financial statements. The irregular expenditure register will be updated accordingly.

ACCOUNTING POLICIES (CONTINUED)

1.24 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 01/04/2019 to 31/03/2020.

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.

Comparative information is not required.

1.25 RELATED PARTIES

The entity operates in an 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 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. Where those charged with governance is employed by an entity receiving funding or doing business with SAMRC the entity is considered to be a related party.

Close members of the family of a persons 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.

1.26 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.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS

2. NEW STANDARDS AND INTERPRETATIONS

2.1 STANDARDS AND INTERPRETATIONS EFFECTIVE AND ADOPTED IN THE CURRENT YEAR

In the current year, the entity has adopted the following standards and interpretations that are effective for the current financial year and that are relevant to its operations:

STANDARD/INTERPRETATION	EFFECTIVE DATE: YEARS BEGINNING ON OR AFTER	EXPECTED IMPACT
GRAP 20: Related parties	1 April, 2019	The adoption of this has not had a material impact on the results of the entity, but has resulted in more disclosure than would have previously been provided in the financial statements
GRAP 32: Service Concession Arrangements: Grantor	1 April, 2019	No impact
GRAP 108: Statutory Receivables	1 April, 2018	Not applicable
GRAP 109: Accounting by Principals and Agents	1 April, 2019	The adoption of this has not had a material impact on the results of the entity, but has resulted in more disclosure than would have previously been provided in the financial statements

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, 2020 or later periods but are not relevant to its operations:

STANDARD/INTERPRETATION	EFFECTIVE DATE	EXPECTED IMPACT
GRAP 34: Separate Financial Statements	Undetermined	Impact is currently being assessed
GRAP 35: Consolidated Financial Statements	Undetermined	Impact is currently being assessed
GRAP 36: Investments in Associates and Joint Ventures	Undetermined	Impact is currently being assessed
GRAP 37: Joint Arrangements	Undetermined	Impact is currently being assessed
GRAP 38: Disclosure of Interests in Other Entities	Undetermined	Impact is currently being assessed
GRAP 110 (as amended 2016): Living and Non-living Resources	Undetermined	Impact is currently being assessed

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2020 31 MARCH R	2019 31 MARCH R
3. FINANCIAL ASSETS AT FAIR VALUE		
Designated at fair value		
Class 1 Listed shares Sanlam demutualisation shares No. of shares 12715 (2019: 12715); Old Mutual demutualisation shares No. of shares 3682 (2019: 3682); Quilter shares No. of shares 1226 (2019: 1226) and Nedbank Ltd shares No. of shares 103 (2019: 103)	733,264	1,078,434
Class 2 Unit trusts SIM General Equity Fund R 17029,97 units (2019: 16595,74 units) and SIM Balanced Fund R 29647,82 (2019: 28926,66)	4,825,480	5,889,917
	5,558,744	**6,968,351**
Current assets		
Designated at fair value	5,558,744	6,968,351

Financial assets at fair value

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 2020 (31 March 2019) is used.

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	733,264	1,078,434
Class 2 Unit trusts	4,825,480	5,889,917
	5,558,744	**6,968,351**

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.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

3. FINANCIAL ASSETS AT FAIR VALUE (CONTINUED)

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 2020

	OPENING BALANCE	GAINS OR LOSSES IN SURPLUS OR DEFICIT	PURCHASES	CLOSING BALANCE
Class 1 Listed shares	1,078,434	(345,170)	–	733,264
Class 2 Unit trusts	5,889,917	(1,220,489)	156,052	4,825,480
	6,968,351	**(1,565,659)**	**156,052**	**5,558,744**

Reconciliation of financial assets at fair value through surplus or deficit measured in level 1 – March 2019

	OPENING BALANCE	GAINS OR LOSSES IN SURPLUS OR DEFICIT	PURCHASES	ISSUES	CLOSING BALANCE
Class 1 Listed shares	1,233,453	(210,725)	–	55,706	1,078,434
Class 2 Unit trusts	5,556,251	203,510	130,156	–	5,889,917
	6,789,704	**(7,215)**	**130,156**	**55,706**	**6,968,351**

4. RECEIVABLES FROM EXCHANGE TRANSACTIONS

	2020 31 MARCH R	2019 31 MARCH R
Trade and research grant debtors	59,106,563	84,097,073
Employee costs in advance	3,952	101,020
Deposits	1,380,478	2,060,175
South African Revenue Services	2,824,561	2,824,561
Staff Loans	41,663	-
	63,357,217	**89,082,829**

The decrease in receivables from exchange transactions is attributed to funder/grantor debtors.

South African Revenue Services (SARS) amount refers to output vat that was disallowed in the September 2016 vat period that was re-assessed in November and December 2017. The output vat is claimable and SAMRC has lodged a dispute with SARS.

The staff loans bear interest at 7.50%

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 counterparty default rates.

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, 2020: R610,051 (2019: R2,322,323) were past due but not impaired.

The ageing of amounts past due but not impaired is as follows:

1 month past due	122,571	2,318,538
2 months past due	7,198	2,238
3 months past due	480,282	1,547

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2020 31 MARCH R	2019 31 MARCH R
4. RECEIVABLES FROM EXCHANGE TRANSACTIONS (CONTINUED)		
Trade and other receivables impaired		
The amount of the provision was R76,483 as of March 31, 2020 (2019: R 34,198). 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	5,471	5,627
2 months but less than 3 months past due	5,391	5,627
More than 3 months past due	65,621	22,944
The carrying amount of trade debtors are denominated in the following currencies:		
Rand	47,187,019	73,631,564
US Dollar	10,749,895	4,838,654
Pound sterling	1,169,649	4,828,560
Euro	–	798,295
	59,106,563	**84,097,073**
Reconciliation of provision for impairment of trade and other receivables		
Opening balance	34,198	40,991
Provision for impairment	76,483	34,198
Unused amounts reversed	(34,198)	(40,991)
	76,483	**34,198**
5. RECEIVABLES FROM NON-EXCHANGE TRANSACTIONS		
Trade debtors	2,281,053	–
At March 31, 2020 there were funder/grantor non-exchange debtors.		
Receivables from non-exchange transactions past due but not impaired		
Other receivables from non-exchange transactions which are less than 3 months past due are not considered to be impaired. At March 31, 2020, R249,199 – (2019: R –) were past due but not impaired.		
1 month past due	249,199	–
Receivables from non-exchange transactions impaired		
As of March 31, 2020, there was no provision for impairment of other receivables from non-exchange transactions as amounts owing were current or 30 – 60 days and are fully recoverable.		
The carrying amount of other receivables from non-exchange transactions are denominated in the following currencies:		
Rand	1,789,887	–
GBP	491,166	–
	2,281,053	–
6. VAT RECEIVABLE		
VAT	**10,689,890**	**5,610,834**
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; airtickets and accommodation.		
Subsistence and travel advances	696,276	670,091
Prepayments – other	7,030,711	7,455,262
	7,726,987	**8,125,353**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

8. CASH AND CASH EQUIVALENTS

	2020 31 MARCH R	2019 31 MARCH R
Cash and cash equivalents consist of:		
Cash on hand	42,685	9,504
Bank balances	370,419,168	463,357,207
	370,461,853	**463,366,711**
Analysis of bank balances		
ABSA and Standard Bank	2,717,710	7,024,865
ABSA funder accounts	4,030,066	4,374,585
First National Bank	53,171	5,608,252
Cash at the Reserve Bank	356,838,231	414,818,220
First National Bank funder accounts	6,779,990	31,531,285
	370,419,168	**463,357,207**

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; MF Ramashala 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	3,827,582	3,536,662
Allocation for the year	263,370	290,920
	4,090,952	**3,827,582**

9. BIOLOGICAL ASSETS THAT FORM PART OF AN AGRICULTURAL ACTIVITY

	2020		2019	
	COST/ VALUATION	CARRYING VALUE	COST/ VALUATION	CARRYING VALUE
Bearer mature biological assets	1,137,538	1,137,538	1,307,270	1,307,270

Reconciliation of biological assets that form part of an agricultural activity – March 2020

	OPENING BALANCE	ADDITIONS	DECREASES DUE TO SALES/ DISPOSALS	TOTAL
Bearer mature biological assets	1,307,270	114,401	(284,133)	1,137,538

Reconciliation of biological assets that form part of an agricultural activity – March 2019

	OPENING BALANCE	ADDITIONS	DECREASES DUE TO SALES/ DISPOSALS	GAINS OR LOSSES ARISING FROM CHANGES IN FAIR VALUE	TOTAL
Bearer mature biological assets	1,285,103	85,801	(214,834)	151,200	1,307,270

SAMRC holds certain monkeys and horses for breeding and external research purposes. All research 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.

Fair value less costs to sell of biological assets during the period	1,137,538	1,307,270

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

10. PROPERTY, PLANT AND EQUIPMENT

	2020 31 MARCH R			2019 31 MARCH R		
	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	1,872,502	–	1,872,502
Buildings	129,669,739	(40,371,636)	89,298,103	117,400,931	(37,583,462)	79,817,469
Vehicles and containers	20,323,345	(12,626,938)	7,696,407	22,197,005	(16,381,748)	5,815,257
Furniture and office equipment	43,134,549	(23,180,944)	19,953,605	42,621,886	(24,020,862)	18,601,024
Computer equipment	70,108,681	(35,194,981)	34,913,700	65,549,544	(32,968,986)	32,580,558
Laboratory equipment	70,204,114	(26,383,646)	43,820,468	67,096,731	(22,926,766)	44,169,965
Other property, plant and equipment – vervet monkeys	1,497,608	(699,321)	798,287	1,531,252	(670,453)	860,799
Total	**336,707,217**	**(138,457,466)**	**198,249,751**	**318,269,851**	**(134,552,277)**	**183,717,574**

Reconciliation of property, plant and equipment – March 2020

	OPENING BALANCE	ADDITIONS	DISPOSALS	TRANSFERS	DEPRECIATION	TOTAL
Land	1,872,502	–	(103,321)	–	–	1,769,181
Buildings	79,817,469	11,710,355	(1,021,830)	1,798,621	(3,006,512)	89,298,103
Vehicles and containers	5,815,257	622,198	(332,667)	(41,712)	1,633,331	7,696,407
Furniture and office equipment	18,601,024	3,971,996	(127,579)	(1,556,147)	(935,689)	19,953,605
Computer equipment	32,580,558	9,743,916	(211,190)	(146,010)	(7,053,574)	34,913,700
Laboratory equipment	44,169,965	4,483,791	(63,816)	(54,752)	(4,714,720)	43,820,468
Other property, plant and equipment – vervet monkeys	860,799	324,304	(172,013)	–	(214,803)	798,287
	183,717,574	**30,856,560**	**(2,032,416)**	**–**	**(14,291,967)**	**198,249,751**

Reconciliation of property, plant and equipment – March 2019

	OPENING BALANCE	ADDITIONS	DISPOSALS	TRANSFERS	DEPRECIATION	TOTAL
Land	1,872,502	–	–	–	–	1,872,502
Buildings	70,283,122	12,993,305	(104,044)	(298,413)	(3,056,501)	79,817,469
Vehicles and containers	6,306,852	738,216	(28,828)	–	(1,200,983)	5,815,257
Furniture and office equipment	18,725,115	3,436,782	(98,503)	314,821	(3,777,191)	18,601,024
Computer equipment	20,670,833	13,076,803	(99,315)	(16,408)	(1,051,355)	32,580,558
Laboratory equipment	40,076,036	8,218,156	(302,904)	–	(3,821,323)	44,169,965
Other property, plant and equipment – vervet monkeys	897,146	40,203	(25,134)	–	(51,416)	860,799
	158,831,606	**38,503,465**	**(658,728)**	**–**	**(12,958,769)**	**183,717,574**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

10. PROPERTY, PLANT AND EQUIPMENT (CONTINUED)

The assets impaired for the discontinued research units is reflected above. The assets impaired constitutes 0.01% (March 2019: 0,02%) of the carrying cost of property, plant and equipment and Nil% for March 2020 (March 2019: Nil%) of the carrying value of intangible assets. The SAMRC Board, at its meeting of 1 March 2013, approved the restructuring of the SAMRC to focus on the 10 highest causes of death in the burden of disease in South Africa. Following this decision the Board at its meeting of 19 February 2014 further approved that discussions be held with institutions for higher learning regarding the transfer of staff and assets of the following units: Promec, Indigenous Knowledge Systems, Oncology and Tuberculosis. To ensure that research in these areas was continued at these institutions it was further agreed that the assets be transferred for no consideration. The approval for this transaction was received from the Minister of Health in terms of the SAMRC materiality framework on 3 April 2014. There was a delay in the collection of the assets due to the outbreak of COVID19. The University of Stellenbosch has agreed to collect the assets as soon as it is practically possible.

During the year under review SAMRC reviewed and changed the useful lives of certain of its assets. The changes made were within the entity's average useful life policy. Certain items of computer equipment assets useful lives changes from 5 to 8 and from 5 to 10 years, certain furniture and office equipment assets lives changes from 3/5/10 to 15 years; vehicles lifespan was changed from 5 years to 10 years, air conditioners useful lives changes from 10 to 15 years and certain items of building assets useful lives was changed from 20 years to 30 years. Transfers between the property, plant and equipment classes also changes the useful lives. The effect of the change in accounting estimate has resulted in a decrease in depreciation amounting to R8,052,926 for the current period. The effect on future periods could not be reasonably determined.

All items of property, plant and equipment are owned by the entity.

There are no restrictions on the title of Property, plant and equipment.

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	1,673,260	9,972,487

Reconciliation of Work-in-Progress March 2020

	INCLUDED WITHIN BUILDINGS	TOTAL
Opening balance	9,972,487	9,972,487
Additions/capital expenditure	3,407,499	3,407,499
Other movements [costs capitalised]	(11,706,726)	(11,706,726)
	1,673,260	**1,673,260**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

10. PROPERTY, PLANT AND EQUIPMENT (CONTINUED)

Reconciliation of Work-in-Progress March 2019

	INCLUDED WITHIN BUILDINGS	TOTAL
Opening balance	165,000	165,000
Additions/capital expenditure	9,972,487	9,972,487
Other movements [costs capitalised]	(165,000)	(165,000)
	9,972,487	**9,972,487**

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	12,043,518	10,974,590

11. INTANGIBLE ASSETS

	2020 31 MARCH R			2019 31 MARCH R		
	COST/ VALUATION	ACCUMULATED AMORTISATION AND ACCUMULATED IMPAIRMENT	CARRYING VALUE	COST/ VALUATION	ACCUMULATED AMORTISATION AND ACCUMULATED IMPAIRMENT	CARRYING VALUE
Computer software	29,505,609	(15,409,616)	14,095,993	25,585,144	(12,911,109)	12,674,035

Reconciliation of intangible assets – March 2020

	OPENING BALANCE	ADDITIONS	DISPOSALS	AMORTISATION	TOTAL
Computer software	12,674,035	3,984,900	(1)	(2,562,941)	14,095,993

Reconciliation of intangible assets – March 2019

	OPENING BALANCE	ADDITIONS	DISPOSALS	AMORTISATION	TOTAL
Computer software	7,069,970	7,242,762	(5,973)	(1,632,724)	12,674,035

There are no restrictions on the title of intangible assets.

During the year under review SAMRC reviewed and changed the useful lives of certain of its intangible assets. The changes made were within the entity's average useful life policy. Certain computer software assets useful lives changes from 5 to 10 years. The effect of the change in accounting estimate has resulted in a decrease in amortisation amounting to R653,682.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

12. INVESTMENTS IN CONTROLLED ENTITIES

NAME OF COMPANY	HELD BY	% HOLDING 2020	% HOLDING 2019	CARRYING AMOUNT 2020 R	CARRYING AMOUNT 2019 R
Medres (Pty) Ltd	SAMRC	100.00 %	100.00 %	1	1
Jirehsa Medical (Pty) Ltd	Medres (Pty) Ltd	42.00 %	25.00 %	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 material.

SAMRC has obtained National Treasury's approval to increase its shareholding in Jirehsa Medical (Pty) Ltd from 25% to 42%.

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.

13. PAYABLES FROM EXCHANGE TRANSACTIONS

	2020 31 MARCH R	2019 31 MARCH R
Trade payables	73,029,747	71,705,353
Leave accrual	25,646,681	24,407,689
Accruals	11,661,014	45,491,876
Interest due to funders	79,558	66,234
	110,417,000	**141,671,152**

The decrease 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	71,239,898	50,835,867
US Dollar	–	1,273,065
Pound Sterling	1,789,849	19,181,248
Euro	–	407,719
Nigerian Naira	–	7,454
	73,029,747	**71,705,353**
Leave accrual		
Balance at the beginning of the year	24,407,689	23,411,905
Leave payouts	(3,218,847)	(1,164,656)
Movement recognised in surplus or deficit	4,457,839	2,160,440
	25,646,681	**24,407,689**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

14. PROVISIONS

Reconciliation of provisions – March 2020

	OPENING BALANCE	ADDITIONS	UTILISED DURING THE YEAR	REVERSED DURING THE YEAR	TOTAL
Provision for bonus dispute	929,019	–	–	–	929,019
Provision for collaborative research	6,664,048	4,259,352	(5,532,894)	(1,083,654)	4,306,852
Provision for performance bonus	4,918,964	5,234,805	(4,820,679)	(98,285)	5,234,805
Other provisions	6,530,283	1,165,018	(5,866,786)	–	1,828,515
	19,042,314	**10,659,175**	**(16,220,359)**	**(1,181,939)**	**12,299,191**

Reconciliation of provisions – March 2019

	OPENING BALANCE	ADDITIONS	UTILISED DURING THE YEAR	TOTAL
Provision for bonus dispute	929,019	–	–	929,019
Provision for collaborative research	10,243,648	6,414,048	(9,993,648)	6,664,048
Provision for performance bonus	4,526,987	4,918,964	(4,526,987)	4,918,964
Other provisions	1,083,922	5,866,786	(420,425)	6,530,283
	16,783,576	**17,199,798**	**(14,941,060)**	**19,042,314**

Collaborative research costs
The provision relates to collaborative research grants that have been awarded during the year under review, the grants will be settled in the next twelve months once the contractual payment terms have been met.

Provision for bonus dispute
The bonus dispute provision relates to the estimated legal costs that needs to be paid to NEHAWU.

Other provisions
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 2020 (COIDA) and repayment of grant/contract funds the Centers for Disease Control and Prevention; GlaxoSmithKline Biologicals SA and WHO (March 2019: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 2019 (COIDA); retention payable on building works and repayment of grant funds to Eli Lilly and Company and Global Genomic Medicine Collaborative).

Provision for performance bonus
The performance bonus cycle was changed after discussions and agreement with the union.The Board approved the bonus cycle, which will result in payments being made after the financial year. The amount reflected is the 2019/2020 provision for performance bonuses.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2020 31 MARCH R	2019 31 MARCH R

15. DEFERRED INCOME (2019 RESTATED)

The decrease in deferred income can be attributed to the utilisation of the following contract funds received in advance: DFID; Department of Science and Technology; and MRC UK.

Deferred income	198,366,172	298,762,926
Summary of deferred income		
Research grants received in advance	197,996,416	297,833,141
Other funds received in advance	369,756	929,785
	198,366,172	**298,762,926**

16. EMPLOYEE BENEFIT OBLIGATIONS

Post retirement medical aid obligation	7,964,000	8,472,000
Pension fund – Defined benefit obligation	(1,303,000)	323,000
Net obligation	**6,661,000**	**8,795,000**

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 investments and cash balances.

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 2017. Next statutory valuation for the fund is 1 April 2020.

(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 MRC Pension Fund and the Post retirement Medical Aid Plan is valued annually in compliance with GRAP 25.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2020 31 MARCH R	2019 31 MARCH R
16. 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	(1,208,000)	(1,231,000)
Present value of the defined benefit obligation-partly or wholly funded	(21,314,000)	(24,753,000)
Fair value of plan assets	14,558,000	17,512,000
Net liability	**(7,964,000)**	**(8,472,000)**
Changes in the present value of the defined benefit obligation are as follows:		
Opening balance	25,984,000	27,993,000
Interest costs	2,186,000	2,159,000
Benefits paid	(2,636,000)	(2,508,000)
Actuarial (gain)	(3,012,000)	(1,660,000)
Closing balance	**22,522,000**	**25,984,000**
Net expense recognised in the statement of financial performance		
Interest cost	2,186,000	2,159,000
Expected return on plan assets	(1,430,000)	(1,323,000)
Contribution paid	(1,423,000)	(1,360,000)
Recognised actuarial loss (gain)	159,000	(1,416,000)
Total included in employee related cost	**(508,000)**	**(1,940,000)**
Calculation of actuarial gains and losses		
Actuarial (gains) losses – Obligation	(3,012,000)	(1,660,000)
Actuarial losses (gains) – Plan assets	3,171,000	244,000
	159,000	**(1,416,000)**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2020 31 MARCH R	2019 31 MARCH R
16. EMPLOYEE BENEFIT OBLIGATIONS (CONTINUED)		
Changes in the fair value of plan assets are as follows:		
Opening balance	17,512,000	17,581,000
Actuarial losses	(3,171,000)	(244,000)
Expected return on plan assets	1,430,000	1,323,000
Contributions by employer	1,423,000	1,360,000
Benefits paid	(2,636,000)	(2,508,000)
Closing balance	**14,558,000**	**17,512,000**

The entity expects to contribute R1,494,000 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.

Key assumptions used		
Assumptions used at the reporting date:		
Discount rates used	11.40 %	8.90 %
General increases to medical aid subsidy	8.60 %	6.80 %
Expected rate of return on assets	11.40 %	8.90 %
Proportion 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 to 1 May 1998	65	65

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.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

16. EMPLOYEE BENEFIT OBLIGATIONS (CONTINUED)

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 2020		
Assumptions as above	22,522	
Discount rate – increases by 1% p.a.	21,074	(6)
Discount rate – decreases by 1% p.a.	24,172	7
Medical inflation – increases by 1% p.a.	24,072	7
Medical inflation – decreases by 1% p.a.	20,598	(9)
March 2019		
Assumptions as above	25,984	
Discount rate – increases by 1% p.a.	24,092	(7)
Discount rate – decreases by 1% p.a.	27,958	8
Medical inflation – increases by 1% p.a.	27,817	7
Medical inflation – decreases by 1% p.a.	24,190	(7)

Amounts for the current period and previous four years are as follows:

	2020 R	2019 R	2018 R	2017 R	2016 R
Defined benefit obligation – partially or wholly unfunded	21,314,000	24,753,000	26,667,000	22,177,000	21,505,000
Defined benefit obligation wholly unfunded	1,208,000	1,231,000	1,326,000	1,194,000	1,144,000
Plan assets	14,558,000	17,512,000	17,581,000	16,206,000	17,217,000
(Deficit) in the plan	(7,964,000)	(8,472,000)	(10,412,000)	(7,165,000)	(5,432,000)

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2020 31 MARCH R	2019 31 MARCH R
16. EMPLOYEE BENEFIT OBLIGATIONS (CONTINUED)		
Pension funds		
Defined benefit obligation – Wholly funded		
Present value of obligation	(84,536,000)	(98,927,000)
Fair value of plan assets	85,839,000	98,604,000
Net Asset (Liability)	**1,303,000**	**(323,000)**
Changes in the present value of the defined benefit obligation are as follows:		
Opening defined benefit obligation	98,927,000	111,435,000
Benefits paid	(16,071,000)	(13,457,000)
Service cost	3,136,000	3,773,000
Interest cost	9,108,000	9,628,000
Actuarial (gain)	(11,415,000)	(13,386,000)
Member contributions	1,205,000	1,352,000
Re-insurance premiums	(180,000)	(210,000)
Expenses	(174,000)	(208,000)
Closed defined benefit obligation closing balance	**84,536,000**	**98,927,000**
Changes in the fair value of plan assets are as follows:		
Opening fair value of plan assets after limitation	98,604,000	99,663,000
Contributions	4,669,000	5,239,000
Benefits paid	(16,071,000)	(13,457,000)
Expected return on plan assets	8,902,000	8,390,000
Actuarial (loss)	(9,911,000)	(813,000)
Re-insurance premiums	(180,000)	(210,000)
Expenses	(174,000)	(208,000)
Closing fair value of plan assets	**85,839,000**	**98,604,000**
Calculation of actuarial gains and losses		
Actuarial (gains) – Obligation	(11,415,000)	(13,386,000)
Actuarial losses – Plan assets	9,911,000	813,000
	(1,504,000)	**(12,573,000)**
Staff costs includes the following in respect of the defined benefit pension plan:		
Current service cost	3,136,000	3,773,000
Interest cost	9,108,000	9,628,000
Expected return on plan assets	(8,902,000)	(8,390,000)
Net actuarial gains (losses) recognised in current year	(1,504,000)	(12,573,000)
Contribution paid	(3,464,000)	(3,887,000)
	(1,626,000)	**(11,449,000)**
The principal actuarial assumptions used in determining the pension plan per annum were:		
General inflation rate	6.10%	5.70%
Discount rate	11.80%	9.60%
Interest income on assets	11.80%	9.60%
Salary inflation – percentage plus merit increase	7.10%	6.70%

The entity expects to contribute R4,669,000 to its defined benefit plan in the following financial year.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

16. EMPLOYEE BENEFIT OBLIGATIONS (CONTINUED)

	2020 R	2019 R	2018 R	2017 R	2016 R
Defined benefit obligation	84,536,000	98,927,000	111,435,000	105,379,000	95,825,000
Plan assets	85,839,000	98,604,000	99,663,000	100,508,000	95,473,000
Surplus (deficit) in the plan	1,303,000	(323,000)	(11,772,000)	(4,871,000)	(352,000)

	2020 31 MARCH R	2019 31 MARCH R
17. EARMARKED FUNDS		
Botha trust	151,636	151,636
Bruhns trust	1,308,446	1,237,964
Melville Douglas trust	13,325	13,325
Q&S Abdool Karim trust	2,700,321	2,578,691
FJ Kleynhans trust	111,442	111,442
	4,285,170	**4,093,058**

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 Bruhns and Q & S Abdool Karim trust funds earned interest.

18. ACCUMULATED SURPLUS (2019 RESTATED)

Accumulated surplus	341,530,495	298,488,509

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.

19. REVENUE

Income from contracts, grants and services rendered (exchange)	423,552,011	437,493,176
Rental income	5,393,995	7,185,956
Bad debt recovered	–	1,457
Other income	12,693,257	3,756,009
Interest received – investment	32,466,696	34,417,767
Dividends received	163,319	129,723
Fair value adjustments	–	143,986
Gain on foreign exchange	4,985,417	8,998,973
Government grants & subsidies	597,100,870	543,329,565
Income from contracts, and grants (non-exchange)	71,651,965	72,578,536
	1,148,007,530	**1,108,035,148**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2020 31 MARCH R	2019 31 MARCH R
19. 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)	423,552,011	437,493,176
Rental income	5,393,995	7,185,956
Bad debt recovered	–	1,457
Gain on foreign exchange	4,985,417	8,998,973
Fair value adjustments	–	143,986
Other income	12,693,257	3,756,009
Interest received – investment	32,466,696	34,417,767
Dividends received	163,319	129,723
	479,254,695	**492,127,047**
The amount included in revenue arising from non-exchange transactions is as follows:		
Baseline grant	597,100,870	543,329,565
Income from contracts and grants (non-exchange)	71,651,965	72,578,536
	668,752,835	**615,908,101**
Revenue		
Income from contract, grants and services rendered – exchange	423,552,011	437,493,176
Income from contract, grants and services rendered – non-exchange	71,651,965	72,578,536
Government grants	597,100,870	543,329,565
	1,092,304,846	**1,053,401,277**
20. OTHER INCOME		
Rental income	5,393,995	7,185,956
Debt impairment recovered	–	1,457
Gain on foreign exchange	4,985,417	8,998,973
Other income	12,693,257	3,756,009
	23,072,669	**19,942,395**
21. INVESTMENT INCOME		
Dividend revenue		
Listed financial assets – Local	163,319	129,723
Interest revenue		
Unit trusts	24,469	29,932
Bank	410,776	673,577
Interest charged on trade and other receivables	11,375	10,415
Corporation for public deposits	32,020,076	33,703,843
	32,466,696	**34,417,767**
	32,630,015	**34,547,490**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2020 31 MARCH R	2019 31 MARCH R
22. OPERATING EXPENSES		
Depreciation and amortisation	16,854,908	14,591,495
Debt impairment	36,521	(3,769)
Employee costs	402,746,555	370,044,580
Loss on disposals of assets	1,318,697	645,767
General expenses	661,781,489	707,561,696
Lease rentals on operating lease	6,161,303	5,902,210
Repairs and maintenance	14,231,559	12,166,586
	1,103,131,032	**1,110,908,565**
23. EMPLOYEE RELATED COSTS		
Basic	225,980,181	214,054,191
Other non pensionable allowances	107,952,772	101,014,899
Bonus	5,136,520	4,982,502
UIF	1,284,485	1,292,657
Leave payments	3,566,487	2,498,978
Adjustments from the application of GRAP 25	(2,134,000)	(13,389,000)
Other salary related costs	8,811,462	7,760,132
Defined pension benefit plan expense – current service cost	3,614,982	4,069,471
Overtime payments	849,525	1,106,657
Temporary staff	22,331,360	23,085,073
Defined pension contribution plan expense	23,929,995	22,208,559
Post retirement medical aid contribution	1,422,786	1,360,461
	402,746,555	**370,044,580**

During the period under review the annual salary increases were paid to qualifying staff members. The increase in the leave liability reflected in the other salary related costs figure can be attributed to staff having till the end of December 2021 to take leave earned in the previous cycle.

A number of staff affected by the National Treasury guideline on increases for employees earning above R1M exercised the option to encash leave.

The bonus amount includes the 2019/2020 provision for performance bonus of R 5,234,805 and an unutlised amount of R98,285 relating to the 2018/2019 that was reversed.

24. FINANCE COSTS

Other interest paid	268,853	313,018

SAMRC had to refund interest due to its funders for monies received in advance (March 2020: R13,323 ; March 2019: R65,847), to the earmarked funds (March 2020: R252,112 ; March 2019: R246,906). 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 2020: R1,020 ; March 2019: R265). During June 2019 SARS issued an assessment for PAYE and levied interest and penalties amounting to R2,398, the matter was investigated. The short payment was due to a payroll processing error.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2020 31 MARCH R	2019 31 MARCH R
25. DEBT IMPAIRMENT		
Debt impairment	–	3,479
Provision/(Reversal) of debt impairment	36,521	(7,248)
	36,521	**(3,769)**

The debt impairment reflected above include the current periods provision for bad debt of R76,483 (including VAT of R7,714) and reversal of the previous year's provision (March 2019 provision for bad debts of R34,198 (including VAT of R1,950).

26. GENERAL EXPENSES		
Advertising	2,364,918	1,761,354
Auditors remuneration	2,786,644	2,296,300
Bank charges	620,705	545,001
Cleaning consumables	3,244,983	2,694,681
Computer expenses	24,139,990	22,369,499
Consulting and professional fees	7,974,091	7,660,711
Insurance	2,462,173	2,126,970
Magazines, books and periodicals	5,111,888	5,073,577
Postage and courier	707,923	485,689
Printing, stationery and publication costs	8,610,262	7,964,007
Security	8,366,532	9,428,709
Subscriptions and membership fees	850,244	1,154,782
Telephone and fax	2,341,611	2,463,595
Training	4,207,072	3,089,512
Travel, subsistence and conference attendance	46,863,307	46,922,623
Utilities	15,417,673	14,394,950
Laboratory operating cost	53,346,659	52,192,071
Skills Development levies	3,024,648	2,679,055
Collaborative research	457,539,975	515,617,938
Other expenses	11,800,191	6,640,672
	661,781,489	**707,561,696**
Travel, subsistence and conference attendance		
Local travel	7,082,100	7,167,310
Overseas travel	9,829,203	9,561,372
Accommodation – local and overseas	8,137,019	10,089,303
Subsistence and travel expenditure	6,855,533	7,850,409
Conference expenditure	8,433,678	6,487,606
Participant incentives	6,525,774	5,766,623
	46,863,307	**46,922,623**
Other expenses		
Canteen costs	2,165,225	1,764,485
Personnel teas	947,465	954,961
Hire of premises and equipment	7,305,619	3,397,388
Licences	97,153	146,430
Staff recruitment costs	355,249	101,460
Employee wellness costs	514,203	–
Pot and plant rental	209,100	225,781
Uniforms	206,177	50,167
	11,800,191	**6,640,672**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

26. GENERAL EXPENSES (2018 RESTATED) (CONTINUED)

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 2019/2020 amount is R147,464,531 (2018/2019 amount is R226,862,229).

The increase in other expenses is mainly attributed to the conference secretariat hosting the SVRI conference.

27. FAIR VALUE ADJUSTMENTS

	2020 31 MARCH R	2019 31 MARCH R
Biological assets – (Fair value model)	–	151,200
Other financial assets		
• Other financial assets at fair value	(1,565,659)	(7,214)
	(1,565,659)	**143,986**

28. AUDITORS' REMUNERATION

Fees	2,786,644	2,296,300

29. OPERATING SURPLUS (DEFICIT)

Operating surplus (deficit) for the year is stated after accounting for the following:

Operating lease charges		
Premises		
• Contractual amounts	6,161,303	5,902,210
Loss on sale of property, plant and equipment	1,318,697	645,767
Gains on exchange differences	(4,985,417)	(8,998,973)
Amortisation on intangible assets	2,562,941	1,632,725
Depreciation on property, plant and equipment	14,291,967	12,958,770
Employee costs	402,746,555	370,044,580
General expenses	661,872,646	707,561,696

30. CASH GENERATED FROM (USED IN) OPERATIONS

Surplus (deficit)	43,041,986	(3,186,435)
Adjustments for:		
Depreciation and amortisation	16,854,908	14,591,495
Loss on sale of assets	1,318,697	645,767
Gain on foreign exchange	(4,985,417)	(8,998,973)
Fair value adjustments	1,565,659	(143,986)
Debt impairment	36,521	(3,769)
Movements in retirement benefit assets and liabilities	(2,134,000)	(13,389,000)
Movements in provisions	(6,743,123)	2,258,738
Capitalisation of financial assets	(156,052)	(185,862)
Changes in working capital:		
Receivables from exchange transactions	30,674,508	(37,179,285)
Receivables from non-exchange transactions	(2,281,053)	–
Prepayments	398,366	(1,010,767)
Payables from exchange transactions	(31,254,153)	23,395,776
VAT	(5,079,056)	9,483,496
Deferred income	(100,396,754)	31,329,704
	(59,138,963)	**17,606,899**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

31. FINANCIAL INSTRUMENTS DISCLOSURE

Categories of financial instruments

March 2020

Financial assets

	AT FAIR VALUE	AT AMORTISED COST	AT COST	TOTAL
Receivables from exchange transactions	–	63,357,217	–	63,357,217
Receivables from non-exchange transactions	–	2,281,053	–	2,281,053
Cash and cash equivalents	–	370,461,853	–	370,461,853
Investment in controlled entities	–	–	2	2
Financial assets	5,558,744	–	–	5,558,744
	5,558,744	**436,100,123**	**2**	**441,658,869**

Financial liabilities

	AT AMORTISED COST	TOTAL
Payables from exchange transactions	110,417,000	110,417,000

March 2019

Financial assets

	AT FAIR VALUE	AT AMORTISED COST	AT COST	TOTAL
Receivables from exchange transactions	–	89,082,829	–	89,082,829
Cash and cash equivalents	–	463,366,711	–	463,366,711
Investment in controlled entities	–	–	2	2
Financial assets	6,968,351	–	–	6,968,351
	6,968,351	**552,449,540**	**2**	**559,417,893**

Financial liabilities

	AT AMORTISED COST	TOTAL
Payables from exchange transactions	141,671,152	141,671,152

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2020 31 MARCH R	2019 31 MARCH R
32. COMMITMENTS		
Authorised commitments		
Already contracted for but not provided for		
• Property, plant and equipment	4,151,834	7,698,667
• Goods and services	7,554,547	13,677,248
• Research grants	16,732,837	8,215,722
• Operating leases	2,638,986	2,630,088
	31,078,204	**32,221,725**
Already contracted for but not provided for	**31,078,204**	32,221,725

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, funds internally generated, etc.

Operating leases – as lessee (expense)

Minimum lease payments due		
– within one year	1,927,096	1,837,236
– in second to fifth year inclusive	711,890	792,852
	2,638,986	**2,630,088**

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	3,560,039	3,950,274
– in second to fifth year inclusive	4,534,373	3,635,069
– later than five years	729,822	1,018,814
	8,824,234	**8,604,157**

Certain of the entity's buildings generate rental income. Lease agreements have terms from 12 months to 9 years and eleven months.

33. CONTINGENCIES

Contingent liabilities

The SAMRC applied to National Treasury to retain accumulated surplus funds of R341,530,495, 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 this amount has been included in the current assets. SAMRC anticipates to recover the interest and penalties amounting R 664,876 from SARS.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

34. RELATED PARTIES

Executive authority	Dept. of Health (DOH)
Other government departments	Dept. of Science & Technology Dept. of Social Development
Controlled entities	Medres (Pty) Ltd Refer to note 12 Jirehsa Medical (Pty) Ltd Refer to note 12
Members of key management	Prof. G Gray (President appointed 1 April 2014). Suppliers and Debtors: Wits Health Consortium – the official is a researcher at the Perinatal HIV Research Unit; National Research Foundation (NRF) – the official is a board member from 1 October 2018 and received research funding for being NRF rated; the official is a director of Hutchinson Centre Research Institute of SA; University of Cape Town – the official is an Audit committee member; the official is a board member of GARDP Foundation Mr. N Buick (Chief Financial Officer appointed 16 July 2012. Supplier and Debtor: University of Western Cape – Audit Committee member) The official is a director of the controlled entity Medres (Pty) Ltd Dr. R Gordon (Ex officio Executive Management Committee member from 1 April 2013. The official was a director of the controlled entity Medres (Pty) Ltd till May 2019 Prof. R Jewkes (Executive scientist research strategy in the office of the president appointed 1 June 2017) Adv. N Bhuka appointed an EMC member from 1 October 2014, resignation date 31 May 2018) Prof. MJ Mphahlele (Vice President appointed 1 October 2014 and extra mural unit director at Sefako Makgatho Health Sciences University (SAMRC supplier); Medical science committee member at the Health Professions Council of South Africa (SAMRC supplier) and SA deputy representative in the General Assembly of the European and Developing Countries Clinical Trials Partnership (EDCTP) (SAMRC debtor and supplier). The official is a board member of South African Health Products Regulatory Authority (SAHPRA) Mr. B Spies (Executive Director Human Capacity Development appointed 1 August 2016) Dr. M Mdhluli (Chief research operations officer appointed 1 September 2017). Mr. M Popo (Legal Counsel)
Board member:	Board members are employed by Universities who contract with SA Medical Research Council for grant income or collaborative research Prof. M Sathekge, term ended 31 October 2019 (University of Pretoria – grant recipient and debtor, director of College of Medicine SA a supplier) Prof. J Mahlangu (University of Witwatersrand and NHLS – grant recipient and debtor) Dr. Z Kwitshana, term ended 31 October 2019 (University KwaZulu Natal – supplier and debtor from 1 July 2019; Mangosuthu University of Technology grant recipient and debtor 1 April 2016 to 30 June 2019) Prof. R Carolissen, term started 1 November 2019 (University of Stellenbosch – grant recipient and debtor) Prof. C Dandara and Dr T Tucker, term started 1 November 2019 (University of Cape Town – grant recipient and debtor) Prof. Q Abdool Karim,term ended 31 October 2019 (CAPRISA – extramural unit, grant recipient and debtor; donor to SAMRC for the the Q&S Abdool Karim fund) Prof. L Skaal and Prof. T Sodi (University of Limpopo – grant recipient and debtor) Prof E Seekoe, term started 1 November 2019 (University of Fort Hare – grant recipient) Prof. M Cotton, term ended 31 October 2019 (University of Stellenbosch – grant recipient and debtor) Prof, S Velaphi (University of Witwatersrand – grant recipient and debtor) Prof. L Zungu and Prof. T Mavundla (University of South Africa – supplier and debtor) Prof. B Shaw (University of Zululand from 1 April 2018 – supplier and debtor) Dr. R Chikwamba, term ended 31 October 2019 (CSIR – supplier and debtor) Dr. M Madikizela, Term started 1 November 2019 (University of Pretoria – grant recipient and debtor) Prof. E Mukwevho, term started 1 November 2019 (North West University – grant recipient and debtor)
Employee: Mr P Charls	Tertiary Education and Research Network of South Africa (TENET) (SAMRC internet service provider, the staff member is a co-opted director on the TENET Board effective 30 April 2015)
Employee: Dr N Abrahams	Sonke Gender Justice Network (service provider, staff member is a director till November 2019)
Employee: Prof. MA Dhansay	National Science and Technology Forum (SAMRC supplier, the staff member is a director)

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

34. RELATED PARTIES (CONTINUED)

Employee: Ms N Naicker	Public Health Association of South Africa (PHASA) (SAMRC supplier and debtor, the staff member is a director)
Employee: Dr R Maharaj	Lubombo Spatial Development Initiative 2 (SAMRC debtor, the staff member is a director)
Employee: Dr M Mulder	Medres (Pty) Ltd and Jirehsa Medical (Pty) Ltd – the staff member is a director of the controlled entities

Related party balances

	2020 31 MARCH R	2019 31 MARCH R
Loan accounts – Owing (to) by related parties		
Medres (Pty) Ltd (The loan is not considered to be recoverable and has been written off.)	218,285	205,415
Amounts included in Trade receivable (Trade Payable) regarding related parties		
European and Developing Countries Clinical Trials Partnership (EDCTP)	392,220	423
Health Professions Council of South Africa	(6,210)	(2,055)
Lubombo Spatial Development Initiative 2	393,819	808,681
National Health Laboratory Services (NHLS)	65,172	–
National Health Laboratory Services (NHLS)	(138,040)	–
SAHPRA	(21,855)	–
Sefako Makgatho University	–	(3,848,251)
Tertiary Education and Research Network of South Africa (TENET)	–	(77,646)
University of Cape Town	–	96,043
University of Cape Town	(20,027,316)	(8,842,631)
University of Limpopo	–	(230,000)
University of Pretoria	37,052	73,556
University of Pretoria	(3,220,497)	(378,430)
UNISA	(198,520)	–
University of Stellenbosch	184,103	171,612
University of Stellenbosch	(2,143,530)	(1,414,614)
University of Western Cape	148,541	427,685
University of Western Cape	(199,400)	(16,820)
Wits Health Consortium	(14,366,311)	(16,260,151)
University of Witwatersrand	16,003	7,198
University of Witwatersrand	(1,582,216)	(23,000)
University of Zululand	(7,378)	–
Deferred Income (grants received in advance from government)		
Dept. of Health (DOH)	4,118,335	25,756,834
Dept. of Science and Technology (DST)	62,319,748	94,259,975
Commitments		
Sefako Makgatho University	–	846,379
University of Cape Town	–	2,575,639
UNISA	557,542	–
Wits Health Consortium	–	4,801,204

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

34. RELATED PARTIES (CONTINUED)

	2020 31 MARCH R	2019 31 MARCH R
Revenue – grants received and services rendered to related parties		
Dept. of Health (DOH, revenue from non-exchange)	597,100,870	543,329,565
Dept. of Health (DOH) Contracts, revenue from exchange	1,936,977	17,531,574
Dept. of Science and Technology (DST)	100,049,996	118,067,176
Dept. Social Development	528,986	–
Council for Scientific and Industrial Research (CSIR)	–	850,989
European and Developing Countries Clinical Trials Partnership (EDCTP)	11,976,968	13,969,770
GARDP Foundation	1,807,477	–
Lubombo Spatial Development Initiative	393,819	703,201
National Health Laboratory Services	2,239,998	–
National Research Foundation	5,887,998	3,542,091
North West University	718,005	–
Sefako Makgatho Health Sciences University	509,469	–
Sonke Gender Justice Network	21,739	–
University of Cape Town	649,272	1,254,482
University of KwaZulu Natal	14,957	–
University of Pretoria	32,219	67,131
University of Stellenbosch	1,105,510	486,271
UNISA	21,739	86,957
University of Western Cape	1,145,951	627,634
University of Witwatersrand	328,006	82,679
Wits Health Consortium	2,730,094	(231,703)
	729,200,050	**700,367,817**
Expenditure such as grants awarded, extra-mural unit grants and collaborative research grants incurred with related party suppliers		
CAPRISA	10,543,955	21,133,182
Council for Scientific and Industrial Research (CSIR)	1,460,704	–
European and Developing Countries Clinical Trials Partnership (EDCTP)	1,304,348	–
Health Professions Council of South Africa	48,225	42,858
Mangosuthu University of Technology	200,000	1,700,652
National Health Laboratory Services	138,040	–
National Research Foundation	1,165,217	–
National Science and Technology Forum	–	26,400
North West University	591,359	–
Public Health Association of South Africa (PHASA)	101,650	21,470
SAHPRA	75,973	–
Sefako Makgatho Health Sciences University	4,850,139	5,826,305
Sonke Gender Justice Network	594,891	1,665,053
Tertiary Education and Research Network of South Africa (TENET)	1,113,108	876,357
University of KwaZulu Natal	4,433,438	–
University of Limpopo	8,485,826	14,511,200

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

34. RELATED PARTIES (CONTINUED)

	2020 31 MARCH R	2019 31 MARCH R
University of Pretoria	15,890,552	11,669,145
University of Cape Town	101,396,061	76,634,622
University of Fort Hare	350,000	–
UNISA	392,138	714,576
University of Stellenbosch	35,327,871	26,683,149
University of Western Cape	9,902,461	11,855,760
University of Witwatersrand	27,679,325	22,968,592
University of Zululand	827,161	832,190
Wits Health Consortium	72,380,825	62,470,511
	299,253,267	**259,632,022**

Executive authority information

Minister:Dr. Z. Mkhize (previously Dr. A Motsoaledi)

No subsistence, travel and other related re-imbursement costs have been paid.

Director General: Ms. Precious Matsoso

No subsistence, travel and other related re-imbursement costs have been paid.

	2020 31 MARCH R	2019 31 MARCH R
Management information		
Executive Directors leave balances		
Mr. N Buick	108,557	154,265
Dr. R Gordon	115,514	99,012
Prof. G. Gray	193,421	360,062
Mr. M Popo	53,461	-
Prof. M Mphahlele	306,283	379,207
Prof. R Jewkes	148,459	172,863
Dr. M Mdhluli	236,498	253,330
Mr. B Spies	236,627	216,344
	1,398,820	**1,635,083**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

35. MEMBER'S EMOLUMENTS

Executive
March 2020

	EMOLUMENTS	VEHICLE & PARKING & CELLPHONE ALLOWANCE	ACCOMMODATION AND ENTERTAINMENT	LOCAL AIR TRAVEL AND PARKING	TOTAL
** Professor J Mahlangu	65,964	7,581	4,245	18,611	96,401
* Professor M Sathekge	102,054	7,049	1,371	18,477	128,951
* Professor Q Abdool Karim	–	–	1,361	–	1,361
* Professor E Bukusi	39,285	2,149	3,029	141,312	185,775
*** Professor R Carolissen	23,571	2,077	–	9,194	34,842
* Doctor R Chikwamba	–	–	–	19,205	19,205
* Professor M Cotton	31,428	2,149	–	–	33,577
*** Professor C Dandara	15,714	1,616	–	9,851	27,181
* Doctor P. Hanekom	84,153	–	–	16,984	101,137
* Advocate N Kadwa	62,856	2,149	–	49,116	114,121
*** Advocate D Khosa	23,571	1,788	3,579	9,034	37,972
* 'Doctor Z Kwitshana	75,519	2,149	4,089	61,457	143,214
*** Professor M Madikizela	26,190	2,040	3,202	11,631	43,063
*** Professor T Mavundla	26,190	2,149	1,849	18,633	48,821
*** Professor E Mukwevho	21,072	3,810	1,790	7,213	33,885
** Professor W Rae	57,618	3,684	12,512	101,944	175,758
*** Professor E Seekoe	15,714	1,535	3,657	7,599	28,505
** Professor B Shaw	122,805	3,857	6,523	70,615	203,800
** Professor L Skaal	75,951	6,290	8,616	41,970	132,827
** Professor T Sodi	96,759	9,582	10,074	50,861	167,276
*** Doctor T Tucker	23,571	1,535	–	–	25,106
** Professor S Velaphi	60,237	4,171	3,135	21,131	88,674
*** Ms J Williams	26,190	2,069	–	8,660	36,919
** Professor L Zungu	57,618	3,937	1,239	26,809	89,603
	1,134,030	**73,366**	**70,271**	**720,307**	**1,997,974**

* Old Board member
** Old and current Board member
*** New Board member

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

35. MEMBER'S EMOLUMENTS (CONTINUED)

March 2019

	EMOLUMENTS	VEHICLE & PARKING & CELLPHONE ALLOWANCE	RE-IMBURSEMENT	ACCOMMODATION AND ENTERTAINMENT	LOCAL AIR TRAVEL AND PARKING	TOTAL
Professor M Sathekge	121,805	14,098	–	5,120	41,185	182,208
Professor E Bukusi	94,148	4,298	–	9,289	191,739	299,474
Doctor P Hanekom	104,184	–	–	–	62,522	166,706
Doctor Z Kwitshana	144,612	4,580	–	7,374	82,723	239,289
Professor Q Abdool Karim	–	–	–	3,350	–	3,350
Professor M Cotton	44,523	921	–	–	–	45,444
Professor J Mahlangu	55,035	2,763	397	2,440	29,083	89,718
Advocate N Kadwa	109,282	4,298	–	8,825	83,310	205,715
Doctor R Chikwamba	–	–	–	–	14,340	14,340
Professor W Rae	57,618	3,684	–	8,735	78,611	148,648
Professor B Shaw	141,290	4,298	–	5,351	86,068	237,007
Professor T Sodi	88,910	4,298	–	11,509	85,314	190,031
Professor L Skaal	75,815	6,608	–	8,797	50,725	141,945
Professor S Velaphi	47,006	3,377	–	–	22,705	73,088
Professor L Zungu	70,713	4,623	–	–	41,802	117,138
	1,154,941	**57,846**	**397**	**70,790**	**870,127**	**2,154,101**

EXECUTIVE DIRECTORS EMOLUMENTS

March 2020

	PACKAGE TOTAL INCL. LEAVE PAYOUT; ALLOWANCES AND LUMP SUMS	BONUS	S & T	COMPANY CONTRIBUTIONS	TOTAL
G Gray (President)	2,795,676	57,216	33,679	198,182	3,084,753
N Buick (CFO)	2,621,250	57,216	14,804	253,659	2,946,929
R Gordon (Executive Director)	1,942,974	57,216	22,099	137,926	2,160,215
MJ Mphahlele (Vice President)	2,383,977	57,216	34,367	162,219	2,637,779
B Spies (Executive Director)	1,512,630	57,216	2,250	195,704	1,767,800
R Jewkes (Executive Scientist Research Strategy)	1,928,993	57,216	37,353	204,193	2,227,755
M Mdhluli (CROO)	1,874,778	57,216	29,664	188,159	2,149,817
M Popo (Executive Director)	1,526,755	–	–	107,794	1,634,549
	16,587,033	**400,512**	**174,216**	**1,447,836**	**18,609,597**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

EXECUTIVE DIRECTORS EMOLUMENTS (CONTINUED)

March 2019

	PACKAGE TOTAL INCL. LEAVE PAYOUT; ALLOWANCES AND LUMP SUMS	BONUS	S & T	COMPANY CONTRIBUTIONS	TOTAL
G Gray (President)	2,796,306	–	42,089	197,552	3,035,947
* N Bhuka (Executive Director)	474,913	–	–	19,900	494,813
N Buick (CFO)	2,622,058	37,335	13,156	252,852	2,925,401
R Gordon (Executive Director)	1,943,411	37,335	34,062	137,490	2,152,298
R Jewkes (Executive Director)	1,848,293	37,335	48,868	203,544	2,138,040
MJ Mphahlele (Vice President)	2,287,258	37,335	39,832	161,704	2,526,129
B Spies (Executive Director)	1,514,559	37,335	61,501	193,775	1,807,170
M Mdhluli (CROO)	1,695,008	37,335	2,626	172,258	1,907,227
** M Popo (Executive Director)	229,580	–	–	16,328	245,908
	15,411,386	**224,010**	**242,134**	**1,355,403**	**17,232,933**

* N Bhuka resignation 31 May 2018.
** M Popo appointed 1 February 2019 (Executive Director).

36. FRUITLESS AND WASTEFUL EXPENDITURE

	2020 31 MARCH R	2019 31 MARCH R
Fruitless and wasteful expenditure – opening balance	92	–
Fruitless and wasteful expenditure current year	873	2,220
Recovered and approved for write-off	(961)	(2,128)
	4	**92**

Expenditure relates to interest on late payment of electricity; Telkom accounts; incorrect interest charge on the corporate credit card and on an assessment for PAYE.

Interest charged due to negligence on the part of the staff members and traffic fines paid is recovered from the employees. An amount of R161 for interest was recovered from staff during the period under review and an amount of R594 invoiced to a staff member who subsequently passed away was written-off.The balance outstanding will be recovered from the responsible staff member.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

37. IRREGULAR EXPENDITURE

	2020 31 MARCH R	2019 31 MARCH R
Opening balance	–	1,217,564
Add: Irregular Expenditure – current period	5,632	151,335
Less: Amounts condoned	(5,632)	(181,585)
Less: Amounts written off by the Board and awaiting condonation by National Treasury	–	(1,187,314)
	–	–

Analysis of expenditure awaiting condonation per age classification

Details of irregular expenditure – current year			
Non compliance with Supply Chain Management Practices	National Treasury – TR 16A 6.1; SCM Practice note 8 of 2007/08: Paragraph 3.2 and NT SCM Instruction No. 7 of 2017/2018: Paragraph 4	5,632	9,512
	National Treasury – TR 16A 6.1; SCMPractice note 8 of 2007/08: Paragraph 3.3 and NT SCM Instruction No. 7 of 2017/2018 Paragraph 4	–	141,823
	Preferential Procurement Regulation 2017, Regulation 8(2) and 8(5)	–	–
	National Treasury – TR 3 of 2016/2017; Paragraph 8.	–	–
		5,632	**151,335**

Details of irregular expenditure condoned

At its meeting in October 2019 the Board condoned expenditure within its authority, totaling R5,632.

At its meeting in May 2018 the Board approved the write-off of irregular expenditure amounts of R918,138 . The expenditure written-off relates to one tender awarded in 2014 where the incorrect points system was used and awards were made to vendors for transactions under R30,000 who were not tax compliant at the date of award. At its meeting in January 2019 the Board approved the write-off of irregular expenditure amounts of R269,176. The expenditure relates to non compliance with the stipulated threshold for local content applicable to office furniture.

Treasury approval was requested to condone irregular expenditure written-off by the Board.

38. 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 Board and includes a note to the annual financial statements.

All deviations were documented and were submitted to the Accounting Authority or its delegate in terms of the Delegation of Authority Framework. Deviations were motivated in advance and subsequently approved.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

39. PUBLIC FINANCE MANAGEMENT ACT (PFMA)

Section 55 (2)

No material losses through criminal conduct were incurred during the period ended 31 March 2020. Irregular and fruitless and wasteful expenditure incurred has been disclosed in notes 36 and 37.

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.

40. BUDGET DIFFERENCES

Material differences between budget and actual amounts

40.1 Income from contracts, grants and services rendered and income from contracts and grants (non-exchange) was higher than anticipated due to project timelines and additional grants received.

40.2 Employee related costs were lower than anticipated due to the decrease in research contract activities and project specific staff appointments.

40.3 Other income is higher than budgeted due to reclassification of recoupment accounts.

40.4 The Infra-structural, communication & statutory costs is higher than anticipated due to costs incurred for municipal rates, water, electricity, telephone and security costs.

40.5 Repairs and maintenance; printing and stationery; external research support and consulting and internal audit costs were lower than anticipated due in part to cost control and efficiency initiatives and lower than anticipated expenditure for the clinical trial sites.

40.6 Travel, subsistence and other expenses were lower than anticipated.

40.7 Collaborative research costs were higher than anticipated mainly due to the activities of GIPD and the Office of Aids and the payments to grantees for the National Health Scolarship Programme.

40.8 The budget did not include the loss on disposal of assets.

40.9 During the year under review the SAMRC reviewed the useful life of its assets, certain items of property, plant and equipment and intangible useful life was changed, resulting in a decrease in depreciation for the year under review. The decrease in depreciation was not taken into account in the budget.

40.10 The weakening of the Rand had a favourable impact on the foreign grant and contract funds received.

40.11 Laboratory operating expenses were lower than anticipated.

40.12 The impact of lockdown at the end of March 2020 adversely affected financial assets, resulting in a unforeseen fair value adjustment.

40.13 Interest received was lower than anticipated due to a decline in the average balance of cash and cash equivalents.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

41. PRIOR PERIOD ERRORS

The following prior period error has been identified and the specific effect on the Financial Statements have been set out in the note below. This error has been corrected and comparatives restated accordingly.

These prior period errors have no tax effect as the entity is exempt in terms of the Income Tax Act.

Grant income for a specific grant from UKMRC was not recognised in the 2016/2017 and 2017/ 2018 financial years. This prior period error resulted in the understatement of Accumulated surplus (2016/2017 – R335,042 and 2017/2018 - R11,584,434) and overstatement of Deferred income (2016/2017 – R335,042 and 2017/2018 – R11,584,434)

The adjustment to the accumulated surplus as a result of the grant income not recognised in 2016/2017 and 2017/2018 amounted to R11,919,476.

The correction of the error(s) results in adjustments as follows:

Statement of financial position

	RESTATED	PREVIOUSLY STATED
Opening Accumulated Surplus at 1 April 2018	301,674,944	289,755,468
Deferred Income	298,762,926	310,682,402
Opening Accumulated Surplus at 1 April 2019	298,488,509	286,569,029

42. 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 and the four major banks with high credit standing.

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.

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 20% of SAMRC's Trade Debtors (R12,410,710) are exposed to currency compared to 12% last year (R10,465,509).

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.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

42. RISK MANAGEMENT (CONTINUED)

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	8.75 %	65,638,270	–	–	–	–
Cash in current banking institutions	– %	370,461,853	–	–	–	–
Trade and other payables – extended credit terms	8.75 %	110,417,000	–	–	–	–

Foreign exchange risk
The entity does not hedge foreign exchange fluctuations.

	2020 31 MARCH R	2019 31 MARCH R
Exchange rates used for conversion of foreign items were:		
USD – ABSA buying	17.5498	14.2536
USD – ABSA selling	17.9503	14.6422
USD – FNB buying	17.6000	14.1778
USD – FNB selling	18.1572	14.7915
GBP – ABSA buying	21.7803	18.5124
GBP – ABSA selling	22.3642	19.0874
GBP – FNB buying	21.6982	18.3915
GBP – FNB selling	22.5594	19.4056
Euro – ABSA buying	–	15.9659
Euro – ABSA selling	–	16.4735
NGN – ABSA selling	–	23.9486

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.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

43. EVENTS AFTER THE REPORTING DATE

The spread of Covid-19 has severely impacted local economies around the globe since Covid-19 was declared a global pandemic by the World Health Organisation on 11 March 2020. In South Africa a national state of disaster in terms of the Disaster Management Act 2002 was declared on 15 March 2020 followed by a national lockdown on 26 March 2020.

Measures taken during the lockdown to contain the spread of the virus, including travel bans, quarantines, social distancing, and closures of non-essential services have triggered significant disruptions to businesses, resulting in an economic slowdown.

The impact of Covid-19 on the operations of the South African Medical Research Council have been considered with respect to future revenues and expenses, funding requirements and the carrying value of assets and liabilities in order to assess the ability of the SAMRC to continue to operate as a going concern.

Future revenues, expenses and funding requirements:

The SAMRC has not received any further reductions in its baseline grant for the 2020-21 financial year from the National Government during the emergency budget tabled on 24 June 2020. The baseline grant for 2020-21 of R621 789 564 is considered sufficient to fund the SAMRC's operations for 2020-21 as detailed in the 2020-21 budget approved by the SAMRC Board. In addition the surplus generated for the year ended 31 March 2020 of R43 041 988 has resulted in an increase in the accumulated surplus to R341 530 495 on 31 March 2020. Subsequent to 31 March 2020 significant new Covid 19 research funding totaling R103 000 000 has been contracted for and is expected to be received during the 2020/21 financial year.

Several categories of expenditure are anticipated to reduce during the 2020/21 financial year. These include travel expenses budgeted at R34 619 508. Staff expenditure budgeted at R427 349 349 for 2020/21 includes an annual increase, the implementation of which has been put on hold at the request of the National Department of Health.

While the pandemic is expected to negatively impact contract revenues recognized in 2021 this will be offset by lower contract expenditure incurred.

Assets and liabilities:

The carrying value of Property Plant and Equipment and intangible assets has been assessed and will not be impacted by the pandemic. Receivables are expected to realised at their carrying values at 31 March 2020 with no further impairment required. The employee benefit assets and obligations reflect the values as calculated by the actuaries and are fully disclosed in note 16.

Financial assets have shown a significant decrease in 2019/20 to R 5 558 744 (R 6 968 351) and reflect the decline in market values at 31 March 2020 resulting from the pandemic. The market values have since recovered during the first quarter of the 2020/21 financial year.

In conclusion the current Covid-19 pandemic and associated lockdown is not expected to impact the ability of the SAMRC to continue to operate as a going concern.

44. SERVICES-IN-KIND

During the year under review the SAMRC's Environment & Health Research Unit utilised office space at the University of Johannesburg; Health Systems Research Unit utilised space at a clinic in Gugulethu and the Alcohol, Tobacco and Other Drug Research Unit utilised space at various district hospitals at no cost. The deemed fair rental value of the space is computed at R205,413 (2019: R160,542).

In addition a staff member was seconded from Wits Health Consortium to the SAMRC to provide secretarial support to the President. The estimated annual value of this service is R386,316 (2019: R361,043).

DETAILED INCOME STATEMENT

	NOTE(S)	2020 31 MARCH R	2019 31 MARCH R
Revenue			
Revenue from exchange transactions			
Income from contracts, grants and services rendered		423,552,011	437,493,176
Rental income		5,393,995	7,185,956
Recoveries		–	1,457
Other income		12,693,257	3,756,009
Interest received – investment	21	32,466,696	34,417,767
Gain on foreign exchange		4,985,417	8,998,973
Fair value adjustments	27	–	143,986
Dividends received	21	163,319	129,723
Total revenue from exchange transactions		**479,254,695**	**492,127,047**
Revenue from non-exchange transactions			
Baseline grant		597,100,870	543,329,565
Income from contracts and grants (non-exchange)		71,651,965	72,578,536
Total revenue from non-exchange transactions		**668,752,835**	**615,908,101**
Total revenue	19	**1,148,007,530**	**1,108,035,148**
Expenditure			
Employee related costs	23	(402,746,555)	(370,044,580)
Depreciation and amortisation		(16,854,908)	(14,591,495)
Finance costs	24	(268,853)	(313,018)
Lease rentals on operating lease		(6,161,303)	(5,902,210)
Debt Impairment	25	(36,521)	3,769
Repairs and maintenance		(14,231,559)	(12,166,586)
Loss on disposal of assets and liabilities		(1,318,697)	(645,767)
Fair value adjustments		(1,565,659)	–
General Expenses	26	(661,781,489)	(707,561,696)
Total expenditure		**(1,104,965,544)**	**(1,111,221,583)**
Surplus (Deficit) for the period		**43,041,986**	**(3,186,435)**

* See Note 41

The supplementary information presented does not form part of the financial statements and is unaudited

LIST OF ABBREVIATIONS

ABV	Antiretroviral therapy, Bleomycin and Vincristine
ARIC	Audit, Risk and IT Committee
ART	Antiretroviral Therapy
ARV	Anti-Retroviral
BMI	Body Mass Index
BODS	Burden of Disease Survey
CCMA	Commission for Conciliation Mediation and Arbitration
CDC	Centre for Disease Control
CEO	Chief Executive Officer
CFO	Chief Finance Officer
CHC	Community Health Centre
CHW	Community Health Worker
CRA	Comparative Risk Assessment
CRS	Clinical Research Site
CSRI	Council for Scientific and Industrial Research
CVD	Cardiovascular Disease
DSI	Department of Science and Innovation
DSM-5	Diagnostic and Statistical Manual
EAP	Employee Assistance Programme
EE	Employment Equity
EDCTP	European Developing Countries Clinical Trials Partnership
EMC	Executive Management Committee
ERMU	Entity-wide Risk Management Unit
FFS	Fee for Service
GACD	Global Alliance for Chronic Disease
GBV	Gender-Based Violence
GCP	Good Clinical Practices
GIPD	Grant Innovation Product Development
GLP	Good Laboratory Practices
GRAP	Generally Recognised Accounting Practice
HIV	Human Immunodeficiency Virus
HIVR4P	HIV Research for Prevention
HPV	Human Papilloma Virus

LIST OF ABBREVIATIONS (CONTINUED)

HPCSA	Health Professional Council of South Africa
HPV	Human Papillomavirus
ICT	Information Communication Technology
KMC	Kangaroo Mother Care
LRA	Labour Relations Act
MTB	Mycobacterium Tuberculosis
MDR TB	Multi Drug Resistant Tuberculosis
MTEF	Medium Tern Expenditure Framework
NCD	Non-Communicable Disease
NEHAWU	National Education Health and Allied Workers Union
NDoH	National department of Health
NHI	National Health Insurance
NHRC	National Health Research Committee
NIH	National Institute for Health
NIAID	National Institute of Allergy and Infectious Diseases
NSDA	National Service Delivery Agreement
OSD	Occupational Specific Dispensation
PFMA	Public Finance Management Act
PHC	Public Health Clinic
PLWHA	People Living with HIV/Aids
PMTCT	Prevention of Mother to Child Transmission
POC	Point of Care
PSCBC	Public Service Coordinating Bargaining Council
SACENDU	South African Community Epidemiology Network on Drug Use
SCM	Supply Chain Management
SHIP	Strategic Health Innovation Partnership
TB	Tuberculosis
TIA	Technology innovation Agency
US	United States
VCT	Voluntary Counselling and Testing
VIPRU	Violence Injury and Peace Research Unit
WHO	World Health Organization
XDR	Extensively Drug-resistant tuberculosis

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