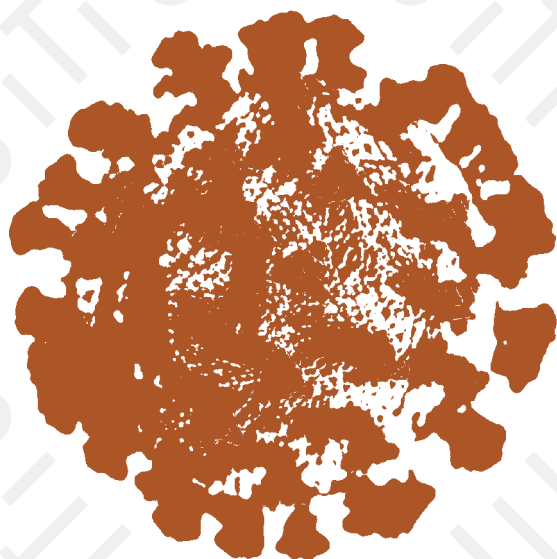


**RESEARCH AT  
STELLENBOSCH UNIVERSITY**  
SHOWCASING RESEARCH EXCELLENCE



2020



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# FOREWORD

PROF WIM DE VILLIERS

On many levels it feels like the previous edition of *Research at Stellenbosch University* was published a lifetime ago. Over the past year and a half, the COVID-19 pandemic has been responsible for immense devastation, personal tragedy and loss in lives and livelihoods across the globe. It has also influenced our connection to time. What happened last week often feels like years ago, and vice versa.

But regardless of lockdowns, isolation and the adjustments we have had to make as the coronavirus infiltrated all aspects of our lives, researchers at Stellenbosch University (SU) rose to the occasion in a remarkable fashion.

Last year, *Research at Stellenbosch University* focused on the work of 2019 and, as a result, only touched on some of the University's pandemic-related research in the foreword and introduction. As can be expected, the pandemic takes centre stage in this year's edition, across the research reports for each of our academic disciplines.

It features breakthroughs in medical research, highlights the important role SU immunology experts are playing in combatting the pandemic, and looks at how biotechnology is being employed to overcome challenges created by COVID-19. It also features research that tracks the socio-economic impact of the pandemic, and emphasises how researchers in the humanities are responding to our current situation.

As I've often mentioned, SU has a continued investment in research. After all, 'Research for impact' is one of our strategic themes. This theme has never proved more tangible than during the pandemic because our research in 2020 had an immediate, real-world impact. This strategic theme forms part of our Vision 2040 and Strategic Framework 2019-2024, which guide us in our mission to stay future-oriented and maximise our impact. In our approach, we consider South Africa's National Development Plan, the African Union's Vision 2063 and the United Nations' Sustainable Development Goals (SDGs) because it is our firm conviction that a university should be connected to the world.

As the content of this publication proves, our researchers are responding to the COVID-19 pandemic with fervour and gusto. The can-do attitude of staff and students – their agility, resourcefulness and willingness to adapt – has propelled many of our researchers to participation in important national and international platforms. It has also enabled us to attract some of the foremost scientists and academics in their fields to join SU's ranks.

It's worth remembering that research does not simply fall from the sky. Humans make it happen. They put in long hours, battle through late nights, and tackle complicated challenges. And what a challenge 2020 proved to be. But challenges also provide opportunities. Although it is easy to view the recent past through a lens of doom and gloom, this publication also offers hope – hope that through resilience, we can indeed move forward together.

**Prof Wim de Villiers**  
*Rector and Vice-Chancellor*

...WHAT A CHALLENGE 2020

PROVED TO BE. BUT CHALLENGES

ALSO PROVIDE OPPORTUNITIES...





# INTRODUCTION

PROF EUGENE CLOETE

The year 2020 will be remembered as the year of the COVID-19 pandemic. It was a year of major disruption, new challenges as well as unprecedented change and adaptation. At SU, we had to mitigate the impact of the pandemic on our research enterprise by setting new objectives and changing the way we do research and postgraduate supervision. Most laboratory research activities and in-person interviews came to a standstill. Our academic staff had to move online for the purposes of teaching and learning. This proved time consuming, and diverted their efforts away from research.





Notwithstanding these challenges, the pandemic itself proved a massive research-instigator, sparking enquiries into solving the most dire of real-world problems. From the outset, our expertise in the fields of epidemiology and virology was in high demand. The role of research and science was suddenly highlighted at the national level. Notably, our leading scientists soon formed part of ministerial advisory committees, informing high-level decisions by the Minister of Health and the national command council responsible for managing the pandemic. Their recommendations were always supported by strong research, ranging from the

modelling of the pandemic and studying the genetic predisposition of individuals, to sequencing the virus and the variants subsequently identified. This constituted translational research and societal impact at the highest level.

From the outset of the pandemic, it was clear that the pandemic would also lead to societal challenges. It was evident that the economic impact would be significant and that this would cause an increase in poverty and the loss of livelihoods. It also had disastrous effects on schooling, as indicated in our research.

Furthermore, the nature of work changed for millions of South Africans,

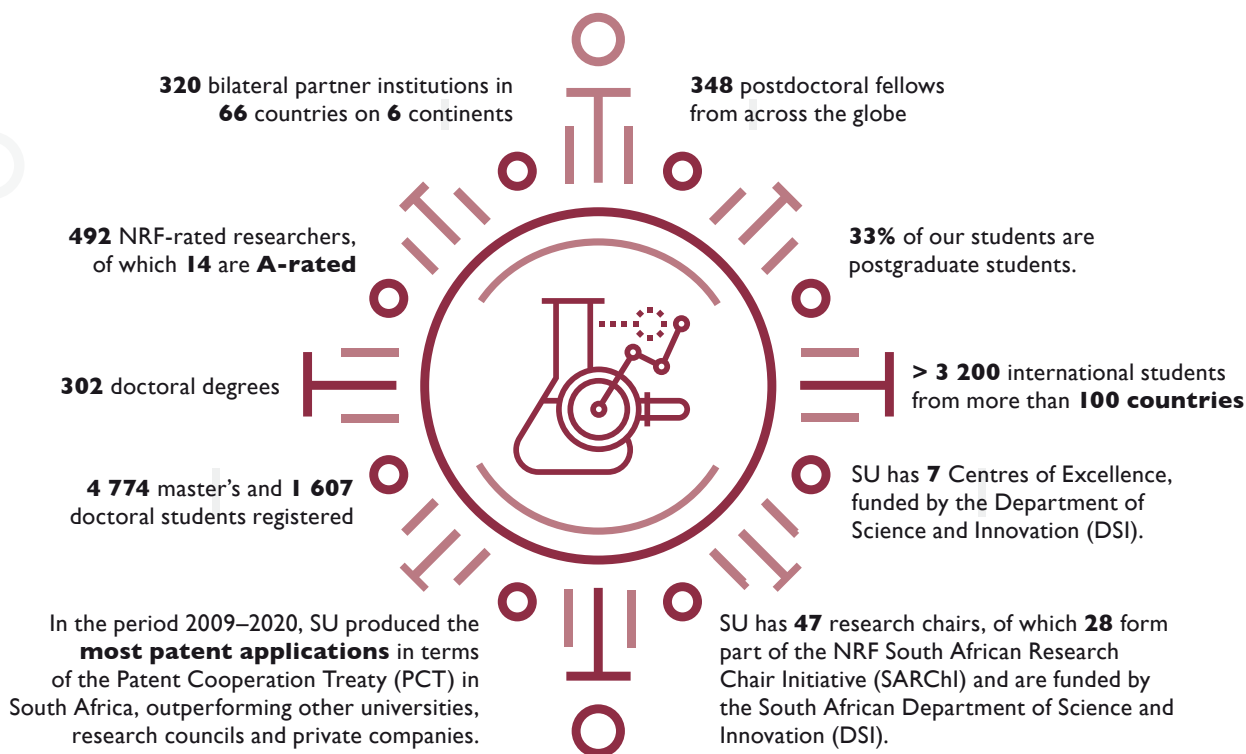
bringing about its own obstacles. The negative effects of having to juggle the demands of work and homelife during lockdown were especially evident in the research outputs of female academics. This was one of the research topics for which our academics provided excellent scientific evidence, on grounds of which they could formulate recommendations for the way forward.

Our staff delivered excellent research outputs during – and despite – these challenging times, and they are commended for this.

#### **Prof Eugene Cloete**

*Deputy Vice-Chancellor: Research, Innovation and Postgraduate Studies*

## RESEARCH SUCCESS\*



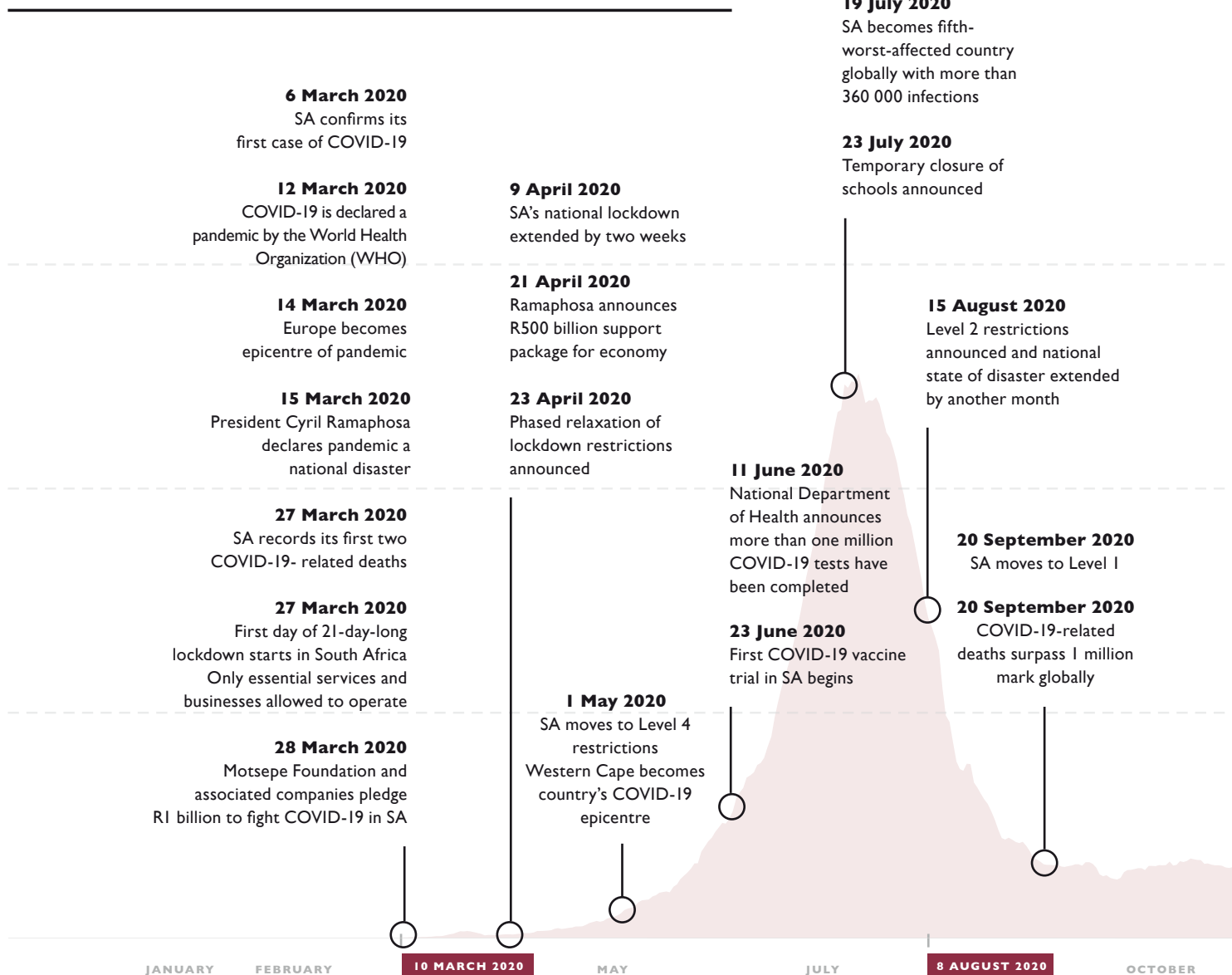
In its annual research output report to the Department of Higher Education and Training (DHET), SU last year again submitted a **record number** of articles in accredited journals, this time in respect of the 2019 publication output year. The **1 596** articles represent a solid increase on the 1 501 reported for 2018.

*\*Up to June 2021*



# TIMELINE: COVID-19 IN SOUTH AFRICA

TRACKING IMPORTANT EVENTS IN THE COUNTRY FROM THE DETECTION  
OF THE FIRST CASE IN MARCH 2020 TO 31 AUGUST 2021<sup>1</sup>





## 9 December 2020

SA enters its second wave of infections

## 18 December 2020

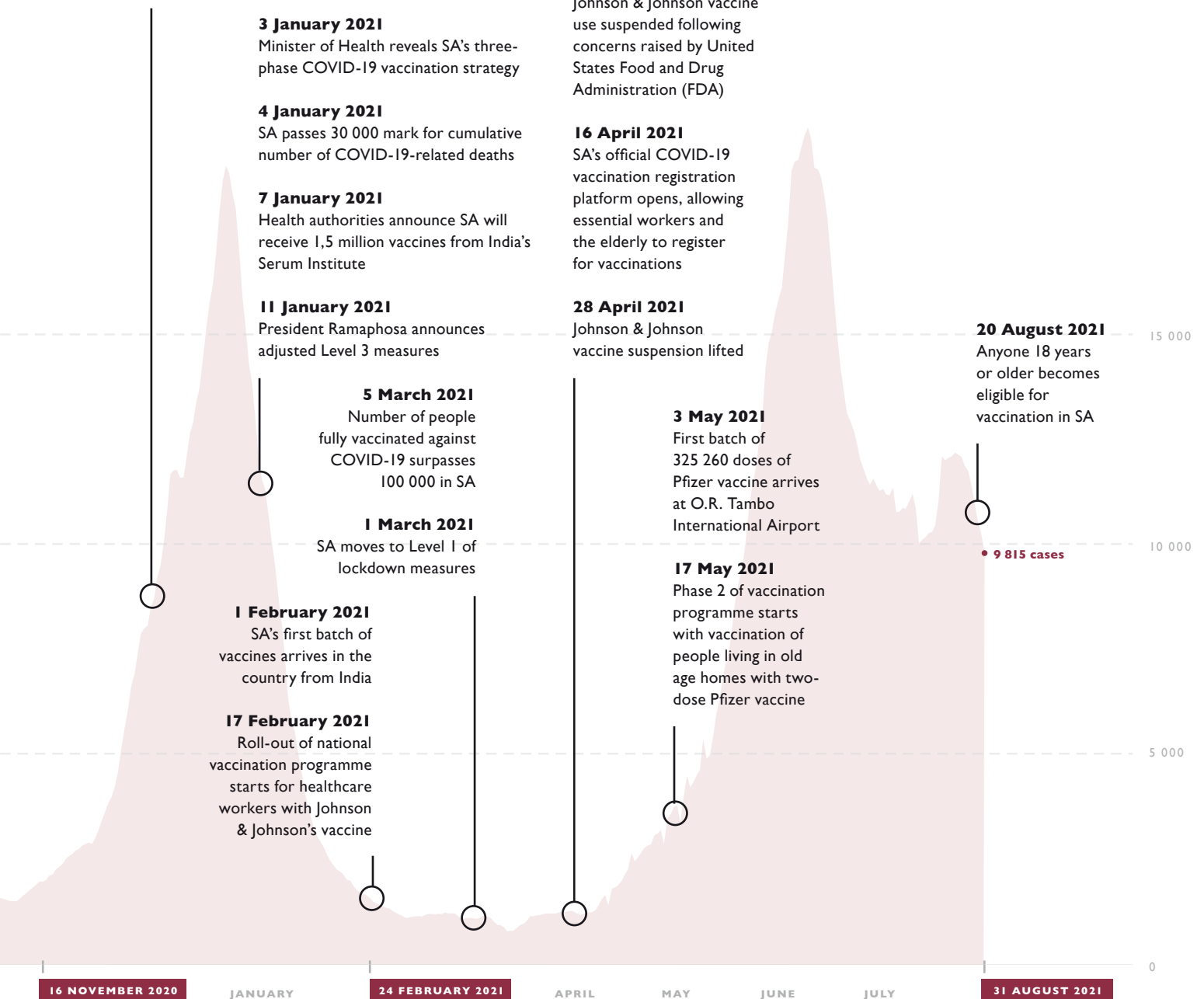
New variant of coronavirus identified as driving SA's second wave of infections

## 27 December 2020

Number of confirmed COVID-19 cases reaches 1 million

Graph: Daily number of new confirmed COVID-19 cases. Shown is the rolling seven-day average. Due to limited testing, the number of confirmed cases is lower than the number of actual cases.

Source: Johns Hopkins University Coronavirus Resource Center



# ADAPTING TO THE 'NEW NORMAL'

**COVID-19 STARTED AS A MEDICAL CRISIS BUT HAS SINCE TOUCHED ALL ASPECTS OF OUR LIVES. STELLENBOSCH UNIVERSITY (SU) EXPERTS SHARE THEIR OPINIONS ON THE MIND SHIFTS REQUIRED TO ADAPT TO THE 'NEW NORMAL'.**

In a crisis, we sometimes focus on one thing only and plan accordingly. Often, better systems are created as a result. Unfortunately, most people suffer from status quo bias and believe the future will be more or less the same as things are now, which impedes futures thinking, says Dr Morné Mostert, the director of the Institute for Futures Research (IFR). "When you are in a highly chaotic environment, your only option is experimentation," Mostert explains.

"The innovators will move forward and leave behind those who have the deluded idea of seeking universal truths or wanting to go 'back to basics'. If you do not participate in designing the future, you end up in the one that someone else designs for you."

Although Mostert believes the pandemic provides an ideal learning opportunity, he realises that most people would rather feed their existing prejudices and ideas through confirmation bias than challenging themselves. Feelings of anxiety linked to COVID-19 also make it very difficult to be creative.

On the economic front, he foresees the death of the intermediary in many industries and major changes to the global value chain. He refers to it as the 'substitution effect' and believes it will be largely digitally driven. "Because of the so-called substitution effect, people start looking around for other solutions when there is an obstacle somewhere.

"If I was used to ordering my goods from China, maybe because of the prevailing complexity, I might now look where I can get them locally." Mostert foresees the substitution effect playing out in the digital world.

People are already increasingly living and working online – everything from telediagnosis to couriered online shopping and telegovernance have proven to be possible. "Thanks to accelerated digitisation, everything that was not digitised before COVID-19 will now be. Some psychological therapy, for example, was previously happening online, but its use has now accelerated," he says.

Mostert is interested in how increasing online learning will affect the so-called 'Covidian' generation's options and perceptions of education. "For the first time in 350 000 years, young people can anachronistically choose for themselves when they want to learn, and autodidactically what they want to learn," he explains. "Crises test systems severely, expose cracks in a big way and increase uncertainty."

That is why Mostert is concerned about the growing divide between those who are struggling to access data compared to the emerging digital elite who can live their lives fully online thanks to 24-hour access to high-speed internet. "All indications are that if access to data is not treated as a universal human right, there will be an increase in inequalities."

He says people value contact with others and being able to look someone in the eye. They tend to intrinsically trust contracts signed before them more than those with a digital signature, for example. He foresees that more rules and closer scrutiny will be called upon to regulate and protect increasing digitalisation, to ensure people's continued trust in systems.

This will also ensure the flourishing of studies on the value and nature of and energy around personal interaction in relation to digital communication. "We've never really needed to understand the power of in-person contact. Digital communication and our appreciation for it will become much more nuanced."

Mostert is concerned that increasing telegovernment practices may lead to more authoritarian states that restrict citizens' privacy and movement, and that these governments will allow themselves the liberty to spy on their citizens under the cover of dealing with, for example, a national or global health crisis.

## How we lead and work

In terms of leadership, Prof Piet Naudé, the director of the University of Stellenbosch Business School (USB), is of the opinion that people will increasingly need quick decision-making skills, ethical conduct under pressure, good communication skills, and the ability to create an alternative future in a creative way.

"We need to learn to see the potential rather than the problem, and learn to build our decisions on the first," he says. Naudé foresees an alternative future for work with more people working flexitime from home, staff not being limited geographically to their workplace, and more meetings going online.

In the alternative future of learning and teaching, Naudé expects that a more robust mixed-learning approach will open new markets for student recruitment and create the chance to lower opportunity costs for those who want to study.

## How we do research

Rising confidence and interest in various disciplines in science, along with coverage of anything from virology to mathematical

modelling and economics, have been a silver lining during the epidemic for Dr Marina Joubert, an expert in science communication at the Centre for Research on Evaluation, Science and Technology (CREST).

“Due to COVID-19, people have realised that research plays a crucial role in our well-being and our future,” Joubert says. She foresees a boom in science and crisis communication expertise and that a wealth of related research will be published in the coming months and years.

During the pandemic, a lack of proven knowledge about the novel coronavirus, in combination with the urgency to communicate about it, proved to be stressful since many scientists prefer not to communicate amidst so much uncertainty, Joubert says. However, in the COVID-19 crisis situation, this has become the ‘new normal’.

Health researchers have, for example, had to adapt quickly to sharing treatment information with each other and concerned citizens. The rise in the number of research preprints in 2020 meant that scientists were frequently called upon to comment on ongoing research and tentative outcomes. One of the best-practice science communication outcomes that has emerged from the pandemic is that scientists are advised to openly admit when results are still uncertain, and to make it clear that they can only offer firm recommendations once new findings have stood the test of rigorous peer review. Also, it helps to explain the process of science, including the fact that recommendations (for example those about wearing masks) may change as new evidence emerges.

Joubert foresees increasing internationalisation of research and collaboration across disciplines: “We are experiencing a situation that affects the whole world. It provides unique opportunities for comparison and the sharing of communication insights between countries and different cultural contexts.”

#### How we create

It may still be a long time before theatres will again provide a safe haven for artists

and the public alike. Unfortunately, the internet will not provide a lifeline for everyone. “With the exception of some contemporary music, visual art, stand-up comedy and classical music performances, the arts do not automatically translate well to the virtual world. Creative and technical criteria have to be adapted, and how we configure budgets and raise sponsorships have also changed. Our yardstick remains excellence,” says Saartjie Botha, the director of the Toyota US Woordfees.

Despite the sober picture she paints, Botha believes the arts have a definite role to play “in the healing of the world, in the understanding of pain and loss due to illness and death, and in a determined affirmation of life, now and post pandemic”.

“During the lockdown and the worst of the pandemic, we saw the world turn to literature, art, poetry and music for reassurance, for comfort and for a vision of a world in community that is celebratory and not fearful,” she says. “We are on our way to that world and the arts are our guides, our signposts and our expressions of faith in our humanity and our resilience. History shows that every time after a global disaster, or period of civil revolt, the arts thrive.”

#### How we practice sport

Ilhaam Groenewald, the chief director of Maties Sport, believes the pandemic is forcing the South African sports business ecosystem to adapt more quickly to developments that have been happening over the last decade in sports globally. This includes developments related to technology, media, broadcasting, fan contact, corporate social responsibility, e-sports and virtual sports. She says a lot will depend on how ready athletes, staff, coaches and support teams are to handle

the ‘new normal’ and to rethink competition formats and schedules, as well as coaching and development plans.

“They will have to adapt exercise programmes to accommodate different groups and types of training,” she explains. Groenewald says that in this respect, sports technology can become a valuable tool. She also hopes sport leadership will invest adequately in medicine and sports science, and research into it. “We will need to review our health and safety policies, monitor and evaluate procedures, and report on them in every part of the business,” she stresses.

#### How we learn

Prof Michael le Cordeur of the Department of Curriculum Studies believes that online learning will be a lasting, complementary medium of education following the pandemic. The South African government and schools will be under pressure to reorganise and fund parent and learner communities so that poorer learners also have good access to e-learning, he says. Le Cordeur predicts that the issue of whose responsibility education is, will receive more attention in the future. In this regard, education unions, parents and the wider community will increasingly have to play a definitive role alongside the education ministry. “For too long, parents have been shirking their role in their children’s education. Poverty is no longer an excuse not to participate in looking for solutions. What is important is that parents themselves take responsibility for their children’s education,” he says.

**WE NEED TO LEARN TO SEE  
THE POTENTIAL RATHER THAN THE  
PROBLEM, AND LEARN TO BUILD  
OUR DECISIONS ON THE FIRST**

# FLATTENING THE CURVE

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# FULL-GENOME SEQUENCING TO DOCUMENT SPREAD OF CORONAVIRUS

**SOON AFTER THE FIRST CASES OF COVID-19 WERE RECOGNISED IN SOUTH AFRICA IN EARLY MARCH 2020, CAPE TOWN BECAME THE FIRST EPIDEMIC HOTSPOT IN THE COUNTRY. THE CITY EXPERIENCED ONGOING VIRUS SPREAD IN SPITE OF THE HIGH-LEVEL LOCKDOWN THAT WAS IMPOSED. GENOMIC SURVEILLANCE CAN HELP US UNDERSTAND WHAT HAPPENED.**

SU's Division of Medical Virology is a partner in the Network for Genomic Surveillance in South Africa<sup>2</sup>. This collaborative effort of partners in several South African universities, the National Health Laboratory Service (NHLS) and research institutions is led by Prof Tulio de Oliveira from the KwaZulu-Natal Research Innovation and Sequencing Platform (KRISP) at the University of KwaZulu-Natal.

This network was established in May 2020 with funding from the South African Medical Research Council (SAMRC) and the Department of Science and Innovation (DSI). It has set itself the goal of sequencing the genomes of at least 10 000 SARS-CoV-2 samples. The data gained are informing the public health response in South Africa by, for instance, monitoring outbreaks in healthcare facilities and workplaces, and by reconstructing the introduction of the virus into the country<sup>3</sup>.

SU's Tygerberg research group first studied data from the early weeks of the epidemic in Cape Town. The researchers analysed patient samples that tested positive for SARS-CoV-2 at the diagnostic virology laboratory of the NHLS Tygerberg during March and April 2020. From these samples, SARS-CoV-2 near full-length genome sequences were generated by means of Oxford Nanopore next-generation sequencing. Almost 50 viral genome sequences were obtained and analysed.

Phylogenetic reconstruction of the epidemic spread suggests that in early March 2020, SARS-CoV-2 was introduced into Cape Town on at least nine occasions. This is evident from the diversity of viruses found in Capetonian patients, reflecting different viral lineages. All viruses emerging from the same introduction belong to the same lineage even if they later diversify further during their spread through the local population.

A much-publicised early superspreading event occurred in a Cape Town suburb in April 2020, affecting 'essential workers' in a commercial environment during the stringent lockdown period. Genomic analysis of patient samples points to a variant previously found in the Netherlands.

In addition, a previously unknown mutation seems to have emerged in Cape Town. While most mutations are not known to have any significance in terms of the transmissibility or pathogenicity of the virus (i.e. its ability to cause disease and harm the host), they can serve as molecular 'markers' that allow the reconstruction of chains of transmission and thus help clarify how the virus spreads.

The study<sup>4</sup>, published in the journal *Viruses*, successfully used genomic surveillance (the analysis of genetic sequences from samples collected in different places and over time, to derive epidemiological information) to investigate and track the spread of

early introductions of SARS-CoV-2 into Cape Town. Similar studies are ongoing in the Western Cape and in other parts of the country, investigating the further course of the pandemic. Having established the technology and expertise to perform sequencing and to analyse sequences, the Tygerberg research group is investigating infection clusters and cases of possible reinfection or breakthrough infection after vaccination.

Prof Susan Engelbrecht, Bronwyn Kleinhans, Kayla Delaney, Prof Gert van Zyl, Prof Wolfgang Preiser, Dr Tongai Maponga and Karabo Phadu from SU's Division of Medical Virology are involved in this research.

## **Scientists identify and track new variants**

While genetic changes in SARS-CoV-2 were used as tools to analyse its epidemic spread, the emergence of several SARS-CoV-2 variants with worrying features since October 2020 caught many by surprise, and has turned out to be a major challenge for control policies and vaccination roll-outs.

Engelbrecht, van Zyl and Preiser are the co-authors of a *research paper*<sup>5</sup> published in the journal *Nature* in April 2021.

**While most mutations are not known to have any significance in terms of the transmissibility or pathogenicity of the virus (i.e. its ability to cause disease and harm the host), they can serve as molecular 'markers' that allow the reconstruction of chains of transmission and thus help clarify how the virus spreads.**

A new SARS-CoV-2 variant termed '501Y.V2' (also known as 'lineage B.1.351') was first found in the Eastern Cape in a sample from early October 2020. It subsequently spread rapidly along the coast both north into KwaZulu-Natal and west into the Garden Route. It is thought that this variant, which appears to be more easily transmissible than 'wild-type' SARS-CoV-2, was a driving force behind the country's massive 'second wave' of COVID-19.

Variant 501Y.V2 displaced the previously prevalent lineages in South Africa and rapidly spread across the country. It has by now been detected in numerous other countries, likely as a result of initial 'importation' and subsequent local transmission.

Its apparent selective advantage seems to be related to either an increased transmissibility or ability to escape an immune response after previous infection or vaccination, or both. Scientists must still determine whether it also tends to cause more severe illness. Yet, the implications of this 'variant of concern' (and some other, similar ones found elsewhere) for vaccination programmes are immense: It was decided not to use over one million doses of the AstraZeneca vaccine, hastily procured by South Africa, as this vaccine proved to have little protective effect against infection and mild illness, caused by the new variant. This was determined in the second phase of a clinical trial conducted in South Africa in late 2020.

While other vaccines seem to provide better protection against the 501Y.V2 virus variant, 'updated' versions of the vaccines will ultimately have to be used and are currently being developed.

The experience since late 2020 has highlighted the importance of conducting comprehensive genomic surveillance programmes. South Africa stands out as a country that did so from early on in the pandemic and was, therefore, able to promptly detect and characterise the new variant. Other countries, including many industrialised ones, have seen the need to step up their own efforts drastically. In many regions of the world, though, there is still little information on the ongoing evolution of the coronavirus.

## MONITORING SARS-COV-2 IN WASTEWATER TREATMENT PLANTS

**RESEARCHERS HAVE IDENTIFIED THE EFFECTIVE DETECTION OF SARS-COV-2 AND THE CONTAINMENT OF INFECTED INDIVIDUALS AS THE PRIMARY MEANS BY WHICH THE COVID-19 PANDEMIC CAN BE CONTROLLED.**

Many research groups have reported that SARS-CoV-2 is highly transmissible through aerosol droplets (spread by, for instance, coughing, sneezing and subsequent droplet inhalation) and surface contact. The elderly and people with comorbidities (such as those with asthma or respiratory problems, or people suffering from heart disease) are regarded as the most susceptible to infection.

Various research groups have also indicated that the faecal matter of infected individuals might transmit SARS-CoV-2, and investigations into the environmental transmission of SARS-CoV-2 are being conducted. For example, SARS-CoV-2 viral ribonucleic acid (RNA) fragments (genetic material of the virus) were detected in wastewater collected from treatment plants in cities in the Netherlands. Similarly, SARS-CoV-2 was quantified in wastewater collected from treatment plants in Brisbane, Australia. The data were applied using a wastewater-based epidemiology approach to estimate the number of infected individuals in the communities surrounding the treatment plants.

Locally, there is also a need to monitor the persistence of SARS-CoV-2 in wastewater treatment plants. As such, the primary aim of a study by Prof Wesaal Khan from SU's Department of Microbiology and her team, in collaboration with the City of Cape Town, was to screen wastewater samples collected from four treatment plants located in the Western Cape. The researchers wanted to determine whether the treatment plants were

effectively removing the SARS-CoV-2 viral gene copies from wastewater.

Samples were collected once a week for two months and immediately processed using concentration methods, followed by RNA extraction and complementary DNA synthesis. Thereafter, the SARS-CoV-2 particles in the collected wastewater samples were detected and quantified using quantitative polymerase chain reaction (qPCR) analysis.

Overall, the results from the study indicated average viral particle removal efficiencies of 100%, 76%, 96% and 99% in the samples collected from the four treatment plants, respectively. This preliminary investigation indicated that the monitored plants – where combinations of the conventional activated sludge (CAS) process, the membrane bioreactor (MBR) process and MBR technology are used – effectively removed SARS-CoV-2 from the wastewater.

However, it should be noted that this study did not assess the viability and infectivity of the detected SARS-CoV-2 viral particles. Future work should, therefore, focus on assessing these factors and applying a wastewater-based epidemiology approach to estimate the number of infected individuals within communities surrounding the treatment plants.

### Wastewater profiling for virus detection

Infected people shed the virus through faeces, and while the risk of transmission via contaminated stools is unlikely, it serves as a marker of infection.



This approach of using markers of infection, known as 'wastewater-based epidemiology', has historically been a valuable tool for monitoring substance use and abuse in communities (for instance, surveillance for prescription and illicit drugs). Recently, it has been extended to also serve as a tool in tracing the prevalence of non-communicable diseases (such as cardiovascular disease and diabetes) and communicable diseases (for example, poliovirus and nosocomial infections caused by antimicrobial-resistant microorganisms).

During the pandemic, many studies have shown the value of this approach in tracing and monitoring changes in the prevalence of infections in human populations feeding into wastewater streams. The detection of the SARS-CoV-2 genetic material in wastewater typically preceded a rise in diagnosed COVID-19 cases and thus presents a valuable early warning of rising numbers of infections and spikes in local hospitalisations.

Due to the nature of infection with SARS-CoV-2, a substantial proportion of infected individuals are asymptomatic, meaning that they do not show any clinical illness but are infectious. For this reason, testing for infection with the causative SARS-CoV-2 virus remains a cornerstone for epidemic control. Yet, the gold-standard test – real-time polymerase chain reaction (PCR) on throat or nose swabs – is technically demanding, labour-intensive, expensive and often not available in sufficient volumes and within short enough turnaround times to control the rapid spread of the disease in communities, even in the developed world.

The pandemic set the scene for the development of a collaboration between Prof Wolfgang Preiser from SU's Division of Medical Virology in the Faculty of Medicine and Health Sciences (FMHS) and Prof Gideon Wolfaardt and Dr Edward Archer from the Stellenbosch University Water Institute (SUWI).

Preiser has over 20 years of experience in diagnostic virology and scientific interest in emerging viral diseases. For the past five years, Wolfaardt and Archer have been working

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**Since early December 2020, ongoing surges in COVID-19 infections in many parts of the Western Cape have been confirmed by means of wastewater epidemiology.**

on wastewater-based research with global leaders in this field such as Prof Barbara Kasprzyk-Hordern from the University of Bath (UK) towards the implementation of community-wide surveillance. The team received the 2020 award of the UKRI Global Challenges Research Fund/ Newton Agile Response to COVID-19, which compares the effect-responses of Cape Town and Lagos for their work.

The team was, therefore, highly suited for strengthening notable regional and national efforts towards the early and rapid detection of COVID-19 cases (ideally before they transmit to others) by looking for the viral signature of SARS-CoV-2 in wastewater.

**Network performs surveillance**

Since April 2020, South African researchers, healthcare practitioners and epidemiologists from various organisations and academic institutions have formed a multidisciplinary network to evaluate the spread of COVID-19 in communities, using wastewater-based epidemiology.

SUWI and the Division of Medical Virology in the FMHS are partners in this national COVID-19 environmental surveillance collaborative. In the Western Cape, the South African Medical Research Council (SAMRC), together with scientists from the City of Cape Town, the Western Cape Provincial Government and the Universities of Cape Town and Stellenbosch, performs routine wastewater surveillance for the Cape Town metropolitan area and beyond. Viral genome detection in wastewater is reported routinely by the provincial health authority.

The team's proof-of-concept report<sup>6</sup> on using wastewater-based epidemiology was published in the *South African Medical Journal*. The researchers extended the wastewater-based epidemiology concept to the surveillance of defined communities such as campus residences and old-age care facilities. The idea is that if such an institution's wastewater contains the SARS-CoV-2 viral genome, it would come from infected residents or individuals working on or visiting the premises. A concerted screening effort may then identify the source, whereafter the infected person(s) can be isolated.

On SU's Tygerberg campus, routine weekly sampling in sewer lines that originate from various locations such as student residences, centres and office buildings revealed positive signals, demonstrating the utility of this approach, with subsequent 'upstream' sampling refining the real-time analyses to pinpoint single buildings as the source.

Since early December 2020, ongoing surges in COVID-19 infections in many parts of the Western Cape have been confirmed by means of wastewater epidemiology.

Surveillance of defined communities can be used to direct community screening efforts and alert medical facilities to potential increases in patient numbers. This may also provide valuable input for dashboards tracking or monitoring the COVID-19 pandemic's ebb and flow within regions.

# SU IMMUNOLOGY EXPERTISE EMPLOYED IN THE BATTLE AGAINST THE PANDEMIC

**BESIDES THE ECONOMIC EFFECTS THAT COVID-19 HAS BROUGHT  
ABOUT, AND THE SUFFERING AND MORTALITIES, IT HAS HAD  
A TREMENDOUS IMPACT ON THE MORALE AND THE GENERAL  
PSYCHOLOGICAL WELL-BEING OF THE SOUTH AFRICAN PUBLIC.**

Since the 1918 Spanish flu outbreak, humanity has not been faced with a similar pandemic. Although healthcare workers are much better prepared now than before the 1918 pandemic, the public has not been confronted with such uncertainty and fear (related to a pandemic) since that time.

The medical fraternity was ill-prepared for the Spanish flu in 1918 because the knowledge of immunology was really just in its infancy, resulting in an estimated number of fatalities worldwide of between 20 million and 40 million people.

Since the outbreak of COVID-19, viral infections have led to the losses of many South Africans. Yet, due to our understanding of the immune system, pandemic-related fatalities have been less than those in the Spanish flu outbreak.

Perhaps not as extensive as the COVID-19 pandemic, the HIV/Aids epidemic brought about huge advances in our understanding of the immune system's ability to deal with viral infections. The knowledge of the immune system and how it copes with infections has grown in leaps and bounds over the past 40 years. Especially the multiplicity of immune mechanisms is now much better understood.

In times of crisis, immunologists can play an important role in explaining the complexities of the immune system to the public, says Dirk Bellstedt, an emeritus professor in SU's Department of Biochemistry. Scientists can apply their knowledge of the human immune system in tests for infections and immunity. These tests could serve as critical diagnostic tools for patient care and recovery.

As the pandemic unfolded, there were reports that the antibody levels induced by COVID-19 infection were found to drop rapidly. It was implied that persons could become infected, time and time again. In hindsight now, it is obvious that the immune system is very capable of containing the COVID-19 virus through vaccination. However, the effects of the pandemic are not over and extreme care must still be taken by all not to become infected until herd immunity is achieved.

## **Critical knowledge about diagnostic tools**

How can our knowledge of the immune system be applied in tests for infection and immunity to serve as critical diagnostic tools for patient care and recovery?

Today, when we think about biotechnology, it is associated with recombinant DNA technology and genetically modified organisms. However, biotechnology extends beyond this to the field of antibody production and the development of antibody-based kits.

During the pandemic, most of the tests for the diagnosis of viral infections have been conducted with tests based on the polymerase chain reaction (PCR). However, antibody-based tests can give much faster results in as little as 15 minutes. Employed in so-called 'laminar flow devices', antibodies that recognise the virus can be used to detect the presence of the virus for its diagnosis. Antibodies can be used to assess whether a patient has shown an immune response against infection or responded to vaccination. Antibodies are, therefore, very powerful biotechnological

tools that can be employed in the battle against the virus.

Under the guidance of Prof Kirsten van der Merwe in the early 1980s, the first biotechnological applications, in the form of antibody-based techniques, were developed at SU's Department of Biochemistry. This led to a patented technology in which bacterial ghosts were used as immune carriers for the immunisation of rabbits, mice and chickens, which then produced antibodies for various applications. This technique, described as the 'naked bacteria' method of antibody production, has subsequently found numerous applications.

For the development of COVID-19 diagnostics, antibodies and polymorphonuclear blood mononuclear cells (PBMCs) were produced in rabbits from March to July 2020. (PBMCs are antibody-producing cells that circulate in the blood in order to spread the antibodies throughout the body.) Under the supervision of Dr Angelique Smit, a veterinarian in SU's Faculty of Science, and following ethical clearance, rabbits were immunised with complexes of naked bacteria and recombinant virus proteins, the receptor-binding main part of the spike protein of COVID-19. This was then supplied, under contract, to the company Cape Bio Pharms (Pty) Ltd.

From the PBMCs, the genes of the antibody-binding area of the antibodies were isolated and cloned into suitable vectors before being introduced into plants, which will produce the antibodies. The rabbit-induced and plant-produced antibodies will be used for the production of antibody-based kits to detect COVID-19 in human blood serum and mucous samples. In this way, an older technology that was already well-established many years ago could be employed in the fight against COVID-19. The development of kits for the diagnosis of COVID-19 by this local company should take away some dependence on the use of expensive imported kits.

Furthermore, established antibody expertise has been applied to produce reagents for viral diagnostics in South Africa, thereby reducing the considerable cost of bringing the pandemic under control and ensuring the safety of South Africa's citizens.

# SPOTLIGHT ON HOME DELIVERY OF MEDICATION BY COMMUNITY HEALTHCARE WORKERS

**BEFORE THE COVID-19 PANDEMIC, SOUTH AFRICAN HEALTH SERVICES WERE ALREADY OVERWHELMED BY THE NUMBER OF RELATIVELY STABLE PATIENTS REQUIRING MONTHLY MEDICATION FOR CHRONIC CONDITIONS. FOR EXAMPLE, OUR COUNTRY HAS THE LARGEST ANTIRETROVIRAL PROGRAMME IN THE WORLD, AS WELL AS INCREASING NUMBERS OF PEOPLE WITH HYPERTENSION, DIABETES AND OTHER NON-COMMUNICABLE DISEASES.**

Many provinces already had established, centralised dispensing units that prepackaged medication and delivered it to alternative pick-up points or support groups to reduce the number of people coming to the pharmacy at primary care facilities.

During COVID-19, primary healthcare services were reorganised to stop people from coming to primary care facilities or support groups to collect medication, and to rather deliver medication at home via community health workers. This had the dual benefit of protecting people from infection and freeing up staff to deal with the surge of COVID-19 patients.

Usually, such a major innovation would be planned and piloted over months, but in this situation, it was implemented in a matter of days. A number of components were already established. The Metro Health Services in Cape Town already had a centralised dispensing and packaging unit that delivered parcels to primary care facilities. In addition, the metropolitan area at the time had a network of 2 500 community health workers in all vulnerable communities. The missing link was the ability to get the parcels from the facility pharmacies to the non-profit

organisations that employed and managed the community health workers. This was initially achieved by the use of Uber drivers who were organised centrally.

Following the implementation of this new system, the Metro Health Services requested an evaluation to help them plan whether it should continue with the initiative after the coronavirus pandemic. An evaluation was conducted by Prof Robert Mash and Dr Darcelle Schouw (Division of Family Medicine and Primary Care, SU), Drs Emmanuelle Daviaud and Donnela Besada (Health Systems Research Unit, South African Medical Research Council) and Darrin Roman (Health Information, Metro Health Services). The evaluation included interviews with key informants, the analysis of routinely collected data, a telephonic survey of patients and a cost analysis.

Over a period of six months, 1 054 657 prepackaged parcels were sent to primary care facilities, 819 649 (77,7%) were delivered and of those, 97 297 (11,9%) were returned to the facility. Parcels were returned for a variety of reasons, including an incorrect address and the patient having moved elsewhere during lockdown or having returned to work after lockdown was eased. Once the system of home

delivery was fully established at the end of the initial six months, the return rate fell to 8,9%, which is lower than the percentage of patients who failed to collect their own medication prior to the pandemic. It appeared that patients were more likely to obtain their medication when it was delivered at home as opposed to having to be collected; 42% reported that they also took their medication more regularly.

Ninety-nine per cent of patients surveyed in the study wanted the service to continue as it meant they did not have to take time off work, queue the whole day at the primary care facility or spend money on transport in order to collect their medication. Community health workers visited more households than usual and were able to perform other activities when they delivered medication. Additional costs mostly related to overtime payment, additional employment of staff at non-profit organisations and transport.


If the costs identified over these six months were calculated over a full year for the entire metro, it would amount to 1,3% of the healthcare budget.

Implementation of this service was not without its challenges. The demand for prepackaged parcels rose from 400 000 to 600 000 per month at the central dispensing unit. Primary care facilities struggled to verify patient addresses and contact details as these had not been updated and many patients had given false addresses in order to attend the facility of their choice.

Handling patients who lived or had moved to an address outside of the catchment area of the primary care facility where their parcel was sent to, was also very difficult. Before COVID-19, they might have travelled to this facility or worked in the area.

Much time was spent attaching address labels, reorganising parcels into





geographic areas corresponding to the non-profit organisations and, subsequently, to the community health worker teams. Transport via Uber was not reliable enough and drivers had to be employed to ensure parcels were available early in the day and delivered close to the teams of community health workers.

Pharmacists were concerned about the track-and-trace system and their ability to know where the medication was and whether it was delivered to the correct person. Audit systems were all paper-based, given the speed of implementation. Communication with patients about the new system and specific deliveries was difficult and many facilities embraced WhatsApp messaging as an effective way of interacting. Community healthcare workers struggled with walking long distances, carrying bulky and heavy parcels,

minimising the risks of crime and violence, and getting all the parcels delivered within a normal working day.

All healthcare workers interviewed thought that the service should continue. Their viewpoint, however, was that it should be a hybrid system with a menu of alternative delivery options offered to patients to ensure that the service could be integrated into the scope of practice of community healthcare workers, who have other roles to fulfil.



# GROWING TOGETHER: RESEARCHERS ISOLATE SOUTH AFRICA'S FIRST LABORATORY CULTURE OF SARS-COV-2

**WHILE LARGE PARTS OF THE SCIENTIFIC AND MEDICAL COMMUNITY RUSH TO IMPROVE THE TREATMENT OF COVID-19 PATIENTS, GAINING A BETTER UNDERSTANDING OF THIS NOVEL VIRUS REMAINS CRUCIAL.**

This is why it is so significant that South Africa obtained its very first known laboratory isolate of SARS-Coronavirus 2 (SARS-CoV-2) on 1 April 2020, courtesy of the collaborative efforts of the University of the Western Cape (UWC) and SU.

A virus isolate is a specific type of virus that can be propagated in the laboratory, using special cell cultures. (Viruses cannot replicate on inanimate media.) This allows researchers to study the infection process in great detail and to generate virus material – under controlled conditions and in defined quantities – for other purposes.

“Having a pure culture of the virus opens doors for research in South Africa,” says Dr Tasnim Suliman of UWC. “Currently, much of the data that exist on this novel virus is based on detecting the genetic material, which is still possible after the virus is ‘dead’. Now, we can experiment on the live virus and observe how it actually behaves in the lab.”

Suliman is a postdoctoral research fellow working under Prof Megan Shaw, an influenza expert based at UWC. Using the biosafety level 3 laboratory at SU’s Division of Medical Virology – with the support of the division’s head, Prof Wolfgang Preiser – Suliman was able to inoculate cell cultures with samples from COVID-19 patients and succeeded in growing the virus.

“We didn’t ‘create’ the virus or modify it in any way,” Suliman notes. “All we did was provide the virus with the right conditions to grow, in a space where we can harvest a large amount of virus to perform research. Strict safety protocols were followed.”

A significant advantage of having an isolate is being able to supply diagnostic laboratories with large amounts of virus genetic material that are identical

in genetic makeup and concentration. This achievement provides indispensable reference material for standardising diagnostic tests across multiple platforms between laboratories.

For example, the virus can be used in experiments to test new antiviral compounds in vitro (in the laboratory). If these compounds show any effect against the virus without harming the cells, they could become candidates for clinical trials.

**The art and science of virus culturing**  
Suliman obtained clinical samples from COVID-19 positive patients at Tygerberg Hospital and inoculated these samples onto live cells that were cultured in the laboratory.

If the virus is present in the clinical sample, it infects the cells and it replicates. This provides a pure culture of the virus – an essential resource for numerous research and clinical laboratories that want to study its biology and need it as, for example, a positive control in their diagnostic tests.

“Virus culture was previously used routinely in diagnostic procedures that have now been replaced with rapid, sophisticated and high-tech molecular techniques with greater capacity and accuracy, and faster turnaround

times,” Shaw says. “Inevitably, virus culturing became a dying technique, and the skill is rapidly fading from the scientific community.”

Unlike bacteria that can be grown quite simply in nutrient-rich media, viruses require living cells to proliferate. They need to attach to and enter cells before redirecting the cells’ machinery to produce the proteins and molecules required to assemble new virus particles. The cells themselves have their own growth requirements. Finding a combination of laboratory-adapted cells compatible with virus growth is a highly delicate process.

“We have to literally synchronise two naturally-occurring biological systems to work together to yield the desired result,” Suliman explains. “Fortunately, the growth requirements of SARS-CoV-2 appear to be very similar to that of SARS-CoV-I, which gave us some sort of a roadmap.”

There are seven known human coronaviruses, three of which cause severe disease. As it happens, Suliman has worked with all three of these to varying extents, as well as with one of the milder disease-causing human coronaviruses.

During her PhD (supervised by UWC coronavirus expert Prof Burtram

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**Virus culture was previously used routinely in diagnostic procedures that have now been replaced with rapid, sophisticated and high-tech molecular techniques with greater capacity and accuracy, and faster turnaround times.**

Fielding), she investigated viral proteins of SARS-CoV-I from the 2002–2003 outbreak. Cloning and culturing this potentially dangerous virus made up a large portion of her work. She spent four years at the University of Bonn, Germany, working with Prof Christian Drosten, a world-renowned coronavirus expert.

She subsequently joined SU's Division of Medical Virology for a postdoctoral research fellowship, hosted by Preiser. Here, she researched coronaviruses found in bats, and their potential transmission to humans, while also managing the Division's biosafety level 3 (BSL-3) laboratory. In 2020, Suliman had already begun to expand her virology experience to the field of influenza viruses in UWC's Shaw Lab when COVID-19 took everyone by surprise.

#### **Lockdown in the laboratory: Working with a live killer**

One of the greatest limitations in growing SARS-CoV-2 is the requirement of a BSL-3 laboratory, as well as the scarcity of these laboratories and trained personnel throughout the country. BSL-3 labs operate at the second-highest biological safety standard, having controlled access, special protective precautions for working inside, a highly efficient filter system to clean all air going into and coming out of the laboratory, and is maintained at a lower pressure than the surrounding atmosphere, to prevent the release of any organisms.

In South Africa, most BSL-3 laboratories lack the setup for dealing with respiratory viruses as they are often geared towards tuberculosis, which is caused by a bacterium.

At the time, Suliman was the only South African to have grown a BSL-3 coronavirus. Since then, Suliman has trained other scientists to do the same. "It was scary at first," Suliman says. "I was acutely aware that all it would take is a suit malfunction and a badly-timed mishap to become infected. But with training and regularly working in the BSL-3 lab, an automatic sense of hyper-alertness develops. You get used to it."

To gain access to the workspace of the BSL-3, one needs to enter through three doors in succession, each preparing

you for the next phase. Together with the outward airflow called 'negative pressure', the multiple doors prevent any aerosols from escaping into general spaces.

"After the first door closes behind you when entering the BSL-3, the door to Stage 2 is opened – leading to a room where protective gear is worn: two pairs of gloves, boots, a back-closing gown or overalls, sleeve covers, and my personal favourite, the powered respirator that filters the air you inhale," Suliman comments. "The battery pack and filter are worn around the waist and a pipe connects it to the headpiece that fits snugly around the head and face. You are now ready to enter the third door to slay coronaviruses!"

And slay them she did.

"I worked day and night and struggled with the lack of some essential materials because, by then, South Africa had entered a lockdown, and there were airfreight bottlenecks," Suliman recalls. "Finally, two weeks after I began, I looked through the microscope and saw dead cells – a sign that my virus was growing. I sat smiling in that isolated high-security lab, with only the whirring of the respirator to punctuate the silence, as I considered the potential of what I held in my hands."

The team has already begun sharing the isolate with multiple researchers and institutions for diagnostic and research purposes. They also share their expertise with TB research groups that have the infrastructure to study respiratory infections on a molecular and clinical scale but are not skilled in handling a virus of this nature.

#### **Handling the variant virus**

In December 2020, when the 501Y.V2 SARS-CoV-2 variant was detected, the UWC-SU collaboration once again came into its own and obtained isolates of the virus variant on cell cultures. This allows comparative studies of the 'wild-type' and variant viruses in terms of, for example, replication activity and might reveal important insights into what makes the variant virus so problematic. The collaborative research project is being funded by the South African Medical Research Council.

Another invaluable advantage of having our 'own' virus isolates is that South Africa is not dependent on the lengthy bureaucratic process of importing virus material from abroad. The SARS-CoV-2 isolates obtained by the UWC-SU collaboration have been supplied to several research groups across the country, allowing them to pursue important projects in basic as well as applied research, such as the validation of diagnostic tests to ensure that they are also able to detect the variant virus.





# SEARCHING FOR BIOMARKERS TO PREDICT COVID-19 SEVERITY

**SU IS THE LEADER IN AN ONGOING NOVEL RESEARCH PROJECT  
THAT COULD ASSIST FRONTLINE WORKERS IN DETERMINING WHICH  
PATIENTS BEING TREATED FOR COVID-19 ARE AT A HIGHER RISK OF  
SEVERE ILLNESS.**

“We are aiming to predict COVID-19’s severity and clinical outcome using routine and novel diagnostic biomarkers,” says Prof Peter Suwirakwenda Nyasulu from the Division of Epidemiology and Biostatistics in the Department of Global Health at SU’s Faculty of Medicine and Health Sciences (FMHS). With Prof Brian Allwood in the Department of Medicine, Prof Annalise Zemlin in the Department of Pathology and other colleagues, they are trying to understand whether specific biomarkers can help us predict which patients are at higher risk of severe illness and death. Knowing this will improve clinical management and allow identification of high-risk COVID-19 patients before they develop more serious symptoms.

The collaborative project, which involves SU, Nairobi University, the Cape Peninsula University of Technology, the University of Limpopo and University College London, has received a two-year, US\$100 000 grant from the COVID-19 Africa Rapid Grant Fund research strand. The fund involves, among others, the Canadian International Development Research Centre, the Newton Fund, UKAid, as well as the South African National Research Foundation and the Department of Science and Innovation.

Data on COVID-19 from Africa remain scarce. There is a reliance on Western data for prediction models of disease severity and death. The demographic profile of patients and the existence of co-infections like HIV and TB mean that the course of illness could vary hugely in the African setting. The biochemical, haematological and immunological profile of patients may be considerably different,

resulting in a prognostic model of COVID-19 that may be unique to Africa.

The study will identify routine biochemical, haematological and immunological biomarkers which predict risk, and determine novel ones not routinely tested for, but possibly associated with risk of severe illness. These novel markers include, but are not limited to, inflammatory cytokines, markers of vascular endothelial damage and novel microRNA markers. Identification of these biomarkers will likely aid the development of more personalised and COVID-19-directed therapeutic approaches.

“If we can identify prognostic biomarkers present at baseline, we hope to develop a risk-predictive score of clinical disease severity requiring critical care. This kind of data can inform frontline workers about specific biomarkers to watch out for. Such biomarkers could be indicative of a higher likelihood that patients will progressively deteriorate and die,” Nyasulu says.

“The study will initially test samples from patients at three hospitals – Tygerberg Hospital, Kenyatta National Hospital and Pietersburg Hospital in Limpopo,” he adds. “We are looking at 150 samples from across the sites and at various time periods. All the testing will be done from serum, so multiple tests will be conducted on the same blood sample.”

In addition to benefitting patients, the study will build capacity and skills in infectious disease research.

“We are hoping to strengthen African science, build skills and strengthen cross-country, inter-university and interdisciplinary collaboration. Within the FMHS, the Department of Global Health, as well as the Departments of Pathology and Medicine, are involved, bringing together a range of epidemiological, basic science and clinical expertise.

“SU is the leader in this novel project. It was a highly competitive call for Africa and the fact that we received the funding puts the institution on the map globally. We are seen as a partner to work with in delivering good science not just for academic purposes but also of direct benefit to patients.

“We believe this could be a ground-breaking scientific study,” Nyasulu says. “The findings could aid substantially in the designing of effective clinical guidelines for COVID-19 management, and minimise the rate of suffering and death of those affected.”

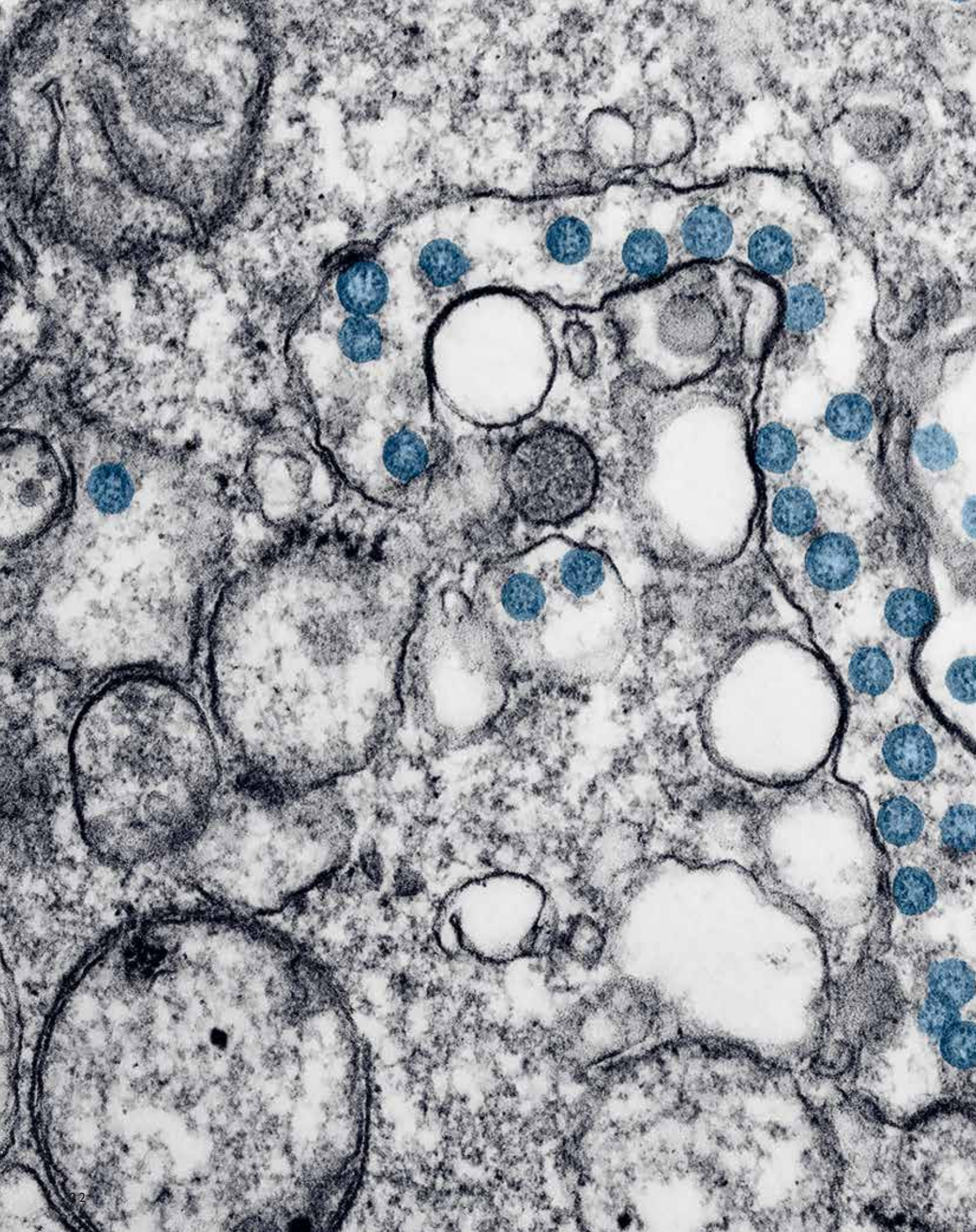
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**We are trying to understand whether specific biomarkers  
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# (BIO)TECHNOLOGY AND THE PANDEMIC

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# ‘ROBOT’ HELPS WITH ICU WARD ROUNDS AND PATIENT VISITS DURING PANDEMIC

**INTENSIVE CARE SPECIALISTS AT TYGERBERG HOSPITAL HAVE A NEW INFECTION-RESISTANT ‘COLLEAGUE’ TO HELP THEM DO WARD ROUNDS ON COVID-19 PATIENTS AND ENABLE VIRTUAL PATIENT VISITS.**

Quintin (as ‘he’ is affectionately called) is a Double Robotics ‘robot’ that has been employed to help specialists do virtual ward rounds – even from home – if they are unable to be physically present. He is also helping put concerned family members in touch with ICU patients that have had to be isolated and, in some cases, is allowing them to say goodbye for the very last time.

## How it all came about

Coenie Koegelenberg, a professor of pulmonology at SU’s Faculty of Medicine and Health Sciences (FMHS), started experimenting with options to perform virtual ward rounds in the intensive care unit (ICU) of Tygerberg Hospital shortly before South Africa’s lockdown started. Today, he is assured that ICU specialists can, indeed, run ward rounds remotely, using robots as tireless helpers that cannot get infected.

The idea of using robots came about through “a combination of thoughts of many people,” Koegelenberg says. “We started wondering how we could help more people if we ourselves were to fall ill. Between the specialists, we share the workload of COVID-19 patients who end up in ICU. The odds of at least one or all of us falling ill are quite high, so we need to realistically plan for what could happen. If any of the specialists gets the virus and is unable to physically go to work, we are able to function remotely using the robot from a phone or a laptop,” says Koegelenberg.

His wife, dermatologist Dr Suretha Kannenberg, originally told him about this device. “On Wednesday 18 March [2020], on my way home after many meetings, I wondered whether ‘virtual’ ward rounds

in many ICUs could be feasible. I phoned my wife and shared my thoughts. I had thought of using a fancy ‘nanny cam’ she bought a few years ago.”

She suggested using the Sunskill laboratory’s Double Robotics robot instead. Sunskill is a state-of-the-art clinical training facility at the FMHS. At that point, Koegelenberg was not familiar with this device. “The next day, I met with Prof Ian Vlok from the Division of Neurosurgery and the Sunskill facilities manager, Bronwyn Stockenström, who gave me a crash course on how to use the Double Robotics robot. The Sunskill lab, without any hesitation, agreed that the robots be used in the ICU until the pandemic is over.”

On the Friday, Dr Usha Lalla, Tygerberg Hospital’s head of ICU, and Koegelenberg tested the device. “We performed a full ICU ward round without entering the ICU. It was truly an eye-opener and a potential game changer in this and future similar pandemics. It was a remarkable success!”

Both Koegelenberg and Lalla concluded (with more than 30 years of combined ICU experience) that their physical presence was not required, and that the technology had great potential to be rolled out. “This is, of course, anecdotal and not ‘true evidence’, but desperate times call for desperate measures,” Koegelenberg said at the time. “Moreover, should one of us be under self-quarantine, we would be able to work from home.”

Robots have also been used in Italy, where the pandemic has claimed many lives, including those of doctors.

## Keeping our doctors safe

The robot, which looks like a computer tablet and has two wheels, uses

gyroscope and accelerometer sensors in its base and can be controlled via an app on a computer, tablet or smartphone. It enables communication between patient and doctor through a microphone and a zoom function, and can relay the vital signs of highly infectious patients.

The fact that Quintin can be remotely steered using an app means that hospital staff do not have to physically enter the ward to position the robot. This reduces their risk of infection, saves on personal protective equipment (PPE) and frees up their time to focus on other tasks.

## Humanising the ICU, through robots

Quintin has been equipped to do video and voice calls, using the freely available WhatsApp service or regular phone calls. This means that family members can dial in to ‘virtually visit’ with patients in the COVID-19 ICU.

Enabling contact between patients and their families has been a “humanising process,” said Dr Kerry Louw, a psychiatrist at SU’s FMHS and Tygerberg Hospital.

She likened the experience of being a patient in an ICU to “a form of psychological anguish that involves a fear of death, unexpected pain and sensory deprivation, as well as overstimulation”.

ICU patients are not only physically ill but often also suffer psychologically because they are isolated from their families, are sleep-deprived due to the constant beeping of machines, and experience no natural light or air movement. “Some patients stay in an ICU for long periods of time, and it becomes really difficult for them,” Louw explains.

“It’s heart-warming to see the smiles once patients have connected with their families. It has made such a difference.

“In some cases, the patients were not awake while their family communicated with them, but it was still meaningful. We were able to organise some end-of-life conversations for people to say goodbye. One family wanted to be present at the moment of passing and we enabled them to be there with the patient.”

Louw said the Department of Psychiatry was already providing individual and group support for healthcare staff working with COVID-19 patients when



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**The robot enables communication between patient and doctor through a microphone and a zoom function, and can relay the vital signs of highly infectious patients.**

a colleague asked if they could help with patient-family contact.

“Staff members of the Department moved into a little office at the ICU to be on site to support the ICU staff. During the first and second waves, we went in every day to be visible to the staff and to give psychological support to the patients.” Currently, the Department’s representatives continue to visit the ward regularly to intensify support, especially when infection rates climb.

When Quintin is called upon to assist, he moves over to the patient and sometimes stays with them for hours while the family visits virtually.

“I always explain to the families beforehand what to expect and what it looks like to see someone who is intubated, as it can be a shock. Some families don’t want visual contact and prefer audio contact. We always check in with the patient to see how they are doing after engaging with their families. We also check in with the families, who can be very emotional after they’ve connected with the patient,” Louw said.

According to Koegelenberg, the idea of using Quintin in this capacity came about “because we didn’t expect the patients to be so aware, awake and anxious”.

“It is difficult for healthcare workers to provide psychological support through a mask and goggles because you look like an alien and it is difficult to hear what people are saying,” he says.

Louw says connecting the family who wanted to be present when their relative passed away was memorable and moving. “We were able to have Quintin present while the family sang and prayed with the patient as he died. It was very powerful.

“It has been a huge privilege to engage with patients and their families at such a vulnerable time in their lives. It is beautiful but hard.”

#### **Thinking out of the box**

The use of the robot at Tygerberg Hospital is yet another example of how the pandemic has brought ingenuity and collaboration to the fore.

“This has been a team effort – and such a bonding experience,” says Koegelenberg.

Vlok, who oversees activity at the Sunskill laboratory, adds: “The Sunskill clinical training facility uses world-class technology to further the skills training of our postgraduate students at SU. The robots have given us access to training with international and national experts in their fields, their virtual presence guiding the teaching and training.

“Now, the same technology can allow us to carefully navigate and manage patients in a high-risk environment and reduce risk to our staff. I sincerely hope this initiative will not only have a positive effect during this pandemic but open the door to further innovation and collaboration.”





# COUGHING UP NEW DIAGNOSTIC TOOLS

**TWO OF THE MOST IMPORTANT INFECTIOUS DISEASES IN MODERN HISTORY, COVID-19 AND TUBERCULOSIS (TB), WILL SOON BE DIAGNOSABLE BY SMARTPHONE APPS, USING COUGH SOUND ANALYSIS.**

Collaborative efforts between SU's Department of Electrical and Electronic Engineering and the Division of Molecular Biology and Human Genetics (MBHG) in the Faculty of Medical and Health Sciences have made great strides towards developing smartphone tools that can triage patients for diagnostic laboratory testing of these lung diseases.

The collaborative project was initiated six years ago when TB researchers at MBHG, Prof Rob Warren and Dr Marisa Klopper, approached a machine learning engineer at the Department of Electrical and Electronic Engineering, Prof Thomas Niesler, to investigate the possibility of identifying an audio signature unique to TB coughs, using computer algorithms. Despite receiving pushback from other researchers and doctors, the team stayed the course to investigate the hypothesis that sound could prove useful for cough classification.

The promising preliminary results showed that a distinctive signature composed of acoustic features not distinguishable by the human ear could identify a TB cough. The project has grown in recent years; with the implementation of superior algorithms to analyse the cough sounds, TB coughs can now be identified with 90% accuracy and, more recently, COVID-19 coughs with 95% accuracy.

"The idea has always been to use cough sound classification as a triage test (to decide whether or not a more expensive laboratory test is needed), but the results, obtained with really small sample sizes, are so good that I'm optimistic that we will one day be able to use it as a direct test," says Klopper. She notes, however, that validation of the algorithm in a much larger population will be necessary.

The team, including other members of both departments, has secured funding from the South African Medical Research Council and from the European & Developing Countries Clinical Trials Partnership for further development of the COVID-19 and TB cough algorithms, respectively. This funding includes a consortium of partners from Europe and Africa.

# SU ENGINEERS ASSIST WITH NATIONAL VENTILATOR PROJECT

**IN EARLY APRIL 2020, THE SOUTH AFRICAN DEPARTMENT OF TRADE, INDUSTRY AND COMPETITION MANDATED THE SOUTH AFRICAN RADIO ASTRONOMY OBSERVATORY (SARAO) TO MANAGE THE LOCAL DEVELOPMENT OF VENTILATORS IN SUPPORT OF THE GOVERNMENT'S EFFORTS AT COMBATING THE COVID-19 PANDEMIC.**

The National Ventilator Project was established to develop and locally manufacture ventilators, using the resources made available by the Council for Scientific and Industrial Research (CSIR) and the SA Ventilator Emergency Project (SAVE-P), a consortium of companies.

The manager of the National Ventilator Project, Willem Esterhuysen from SARAO, approached SU's Department of Mechanical and Mechatronic Engineering to assist with the testing of a concept continuous positive airway pressure (CPAP) device. As the name implies, a CPAP device ensures a continuous supply of pressurised air to assist with a patient's breathing process.

Given lockdown circumstances, a basic laboratory was set up. This was done with the help of Dr Johan van der Merwe of the SU Institute for Biomedical Engineering. Certain staff members were also asked to voluntarily assist with the project on very short notice.

Since the country was still under Stage 5 of the lockdown, special permission had to be obtained from the relevant authorities for persons to travel to and to enter the university premises. Thanks to remote assistance from the administrative personnel in the Department, it was possible to source and purchase items like medical oxygen, oxygen sensors, tubing, flow sensors and regulators.

Several components had to be manufactured in the Department's workshop; Ferdi Zietsman from the workshop provided on-site assistance while testing took place. Cobus

Zietsman assisted with the sourcing of instrumentation from the Department's instrumentation store.

The specific CPAP device that was tested was manufactured from a design published online by engineers from University College London (UCL) and Mercedes Formula One. The device works on the principle of air entrainment. The pressurised oxygen supply is accelerated through a very small nozzle (the actual design specifies a hypodermic tube) that entrains atmospheric air into the gas stream before it is supplied to the patient. By regulating the oxygen supply, and making use of an adjustable positive end-expiratory pressure (PEEP) valve, the pressure, flow rate and oxygen content of the gas supplied by the CPAP device can be adjusted. The device can, therefore, be used to supply a pressurised oxygen-rich gas stream to a patient without the need for an additional compressed air supply. The tests showed that the device performed as expected.

Although the Department played a minor role in the National Ventilator Project as a whole, the test results obtained from these experiments were vital in that they enabled the SARAO engineers to form a clear and accurate picture of the capabilities of the specific CPAP device, and to evaluate the results obtained from other devices developed in the industry.

The multiple variations and components of the device tested were manufactured under the guidance of Ockert Strydom in the workshops of SARAO. The costs of the assistance provided by the Department were carried by the special COVID-19

fund of the Deputy Vice-Chancellor: Research, Innovation and Postgraduate Studies. Credit is also due to the Clinical Engineering Department at Tygerberg Hospital and Arrabon Medical Solutions for assisting with the supply and loan of equipment to the project on very short notice.







# SU AND LOCAL BIOTECH COMPANY TACKLE COVID-19 TOGETHER

**SU AND AZARGEN BIOTECHNOLOGIES (PTY) LTD HAVE JOINED FORCES IN THE GLOBAL FIGHT AGAINST THE CORONAVIRUS. THIS COLLABORATION WILL SEE THE PARTNERS FURTHER DEVELOP SYN SURF®, A SYNTHETIC PHARMACEUTICAL TO BE TESTED AS A SUPPORTIVE AGENT FOR THE TREATMENT OF ACUTE RESPIRATORY DISTRESS SYNDROME (ARDS). BASED ON THE LATEST RESEARCH, PUBLISHED IN 2020, ARDS IS ONE OF THE MAJOR REASONS WHY COVID-19 PATIENTS BECOME CRITICALLY ILL AND/OR DIE.**

AzarGen is a South African biotechnology company focused on developing human therapeutic proteins using advanced genetic engineering and synthetic biology techniques in plants. Their scientific innovation is funded by South Africa's Industrial Development Corporation. Based in Stellenbosch and housed at SU's LaunchLab business incubator, AzarGen is known for developing therapeutic candidates for cancer and respiratory disease.

## **A synthetic, non-animal-derived version of lung surfactant**

Lung surfactant is a detergent-like compound produced naturally in the lungs that is essential for lowering surface tension and increasing lung compliance during breathing. SynSurf® is a synthetically produced chemical formulation that mimics natural (biological) surfactant. It was initially developed and preclinically tested for the treatment of acute lung injury in adults and neonatal respiratory distress syndrome (NRDS), a condition that causes premature babies to struggle with breathing due to collapsed lung sacs.

The product was developed by a team led by Profs Johan Smith, Johan van Zyl and Pieter van der Bijl of SU's Faculty of Medicine and Health Sciences. From AzarGen's side, the team is complemented by co-founders Drs Mauritz Venter and Cobus Zwiendelaar.

Smith, who obtained a doctorate in synthetic lung surfactant development, first started his research aimed at designing, developing and testing a local

surfactant formulation in 1995, with the majority of the work taking place between 1999 and 2005.

"The initial aim changed somewhat when the researchers developed an improved formulation that could compete with commercially available surfactants (that had been proven in experimental animal studies)," says Smith.

"However, since commercially available surfactant is very expensive, its cost has, to date, precluded adult patients from being treated. SynSurf® is composed of pure chemical substances, which overcomes the cost issue to a great extent and almost excludes the batch-to-batch variation issues one expects with mammalian- (animal-) derived formulations. SynSurf®, in experimental animals, has not shown any toxicity or adverse effects," explains Smith.

He says SynSurf® still requires testing in humans, but if the laboratory tests and experimental work are any indication, the product has huge potential to ameliorate and/or treat lung conditions in both newborns and adults. Apart from being able to replace or support deficient lung surfactant in premature newborns, "SynSurf® has the potential to strengthen poorly functioning lung surfactant, such as that found in severe adult acute lung injuries related to serious COVID-19 and other bacterial infections," Smith says.

He adds that specific laboratory work with SynSurf® has shown that it decreases inflammation and the factors that induce inflammation in the lungs. This aspect of SynSurf® could be 'exploited' to suppress the inflammation that accompanies serious lung conditions such as those

related to SARS, swine flu and COVID-19 lung infections.

Anita Nel, the chief director responsible for innovation and business development at Innovus, SU's industry interaction platform for the commercialisation of the University's assets, says they are pleased that SU can work with AzarGen in developing SynSurf® to advance this important surfactant product into practical use and possibly help alleviate the effects of COVID-19 lung infections.

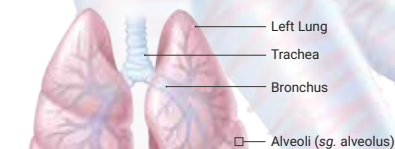
"We need to focus on getting SynSurf® to the patient," adds Venter, CEO of AzarGen. He emphasises that regulatory oversight and resource allocation for all development aspects of this project, including manufacturing and preclinical and clinical testing, are now "a high priority".

*Opposite: An infographic detailing the effect of COVID-19 on one's lungs ([www.visualcapitalist.com](http://www.visualcapitalist.com))*

# COVID-19

## HOW DOES IT AFFECT YOU?

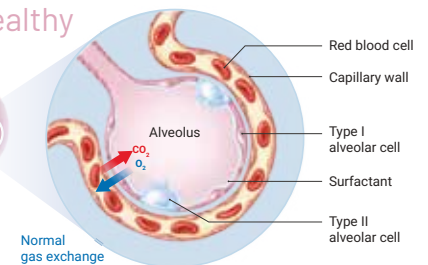
Coronavirus Disease 2019 (COVID-19) is a pandemic caused by Severe Acute Respiratory Syndrome Coronavirus 2, also called SARS-CoV-2. Despite the widespread awareness regarding COVID-19, many are still unaware about how it affects the human body.



SARS-CoV-2 starts its journey in the nose, mouth, or eyes and travels down to the alveoli in the lungs. Alveoli are tiny sacs of air where gas exchange occurs.

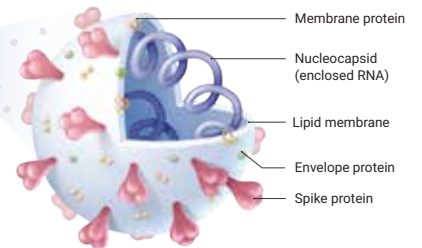
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### Healthy

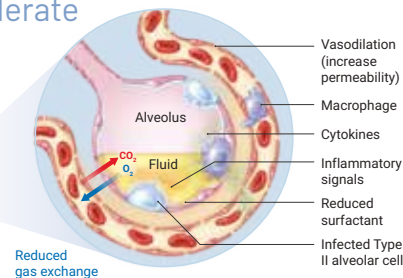


### Infected

#### SARS-CoV-2 Structure



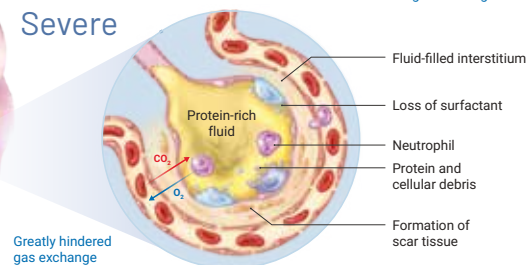
### Moderate



#### Viral Infection

The spike proteins covering the coronavirus bind ACE2 receptors on type II alveolar cells, allowing the virus to enter the cell via endosome or membrane fusion and release its RNA. The RNA "hijacks" the cell, telling it to assemble many more copies of the virus and release them into the alveolus. The host cell is destroyed in this process and the new coronaviruses infect neighbouring cells.

### Severe



#### Impaired Gas Exchange

When the immune system attacks the area of infection it also kills healthy alveolar cells. This results in three things that hinder gas exchange:

- 1) Alveolar collapse due to loss of surfactant from Type II cells
- 2) Less oxygen enters the bloodstream due to lack of Type I cells
- 3) More fluid enters the alveolus

#### Stay Home

Symptoms may start to show (e.g. dry cough, fever, etc.)

#### Pneumonia develops

Shortness of breath

#### Hospitalization

Dangerous for high-risk individuals; secondary infections may occur

#### Intensive Care (ICU)

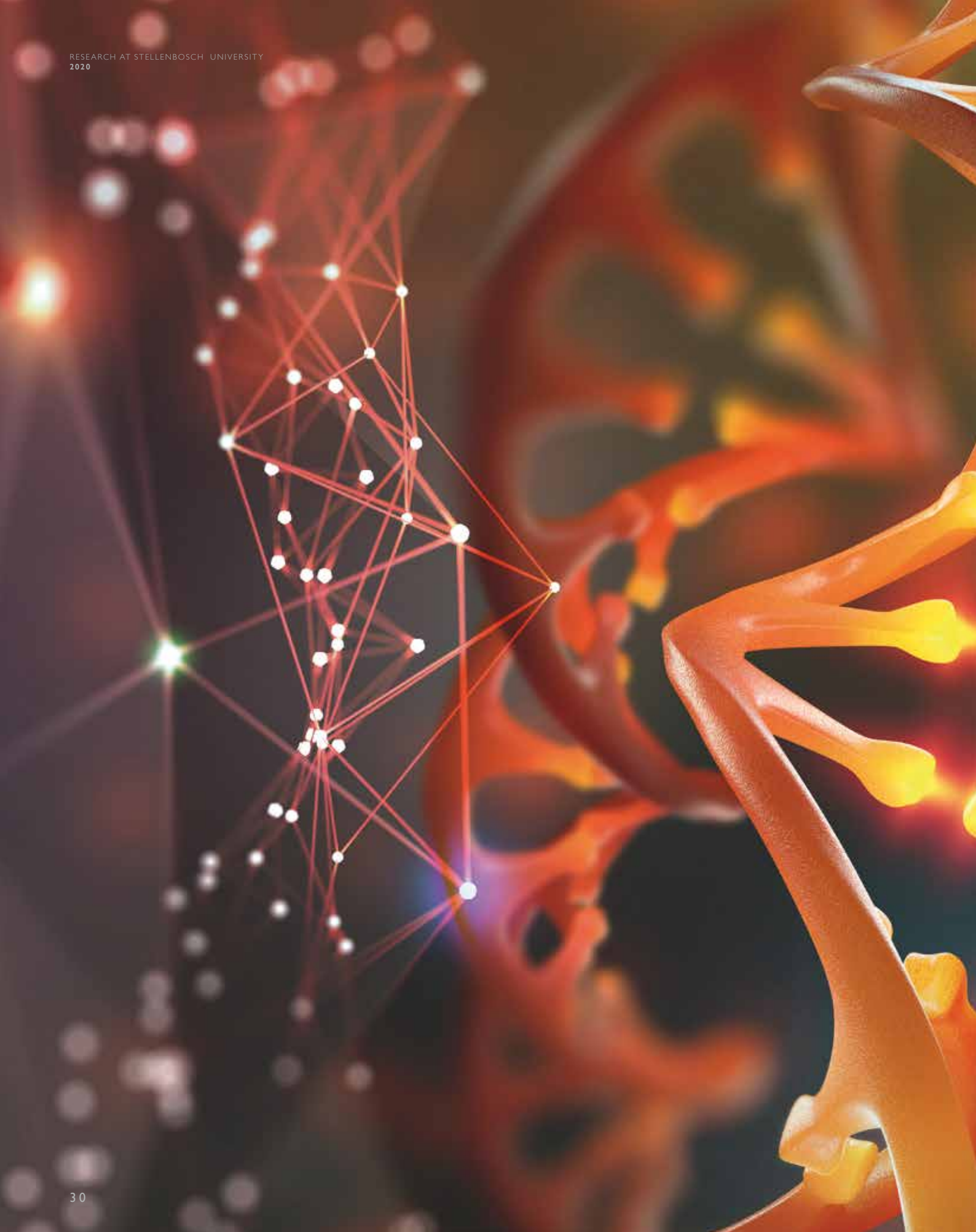
Patients may require ventilators and life-support

Complications unrelated to COVID-19 may occur

With proper care, patients may recover at any point during this process

#### Immune Response

- 1 After infection, type II cells release **inflammatory signals** that recruit **macrophages** (immune cells).
- 2 Macrophages release **cytokines** that cause vasodilation, which allows more immune cells to come to the site of injury and exit the capillary.
- 3 Fluid accumulates inside the alveolus.
- 4 The fluid dilutes the surfactant which triggers the onset of alveolar collapse, decreasing gas exchange and increasing the work of breathing.
- 5 **Neutrophils** are recruited to the site of infection and release Reactive Oxygen Species (ROS) to destroy infected cells.
- 6 Type I and II cells are destroyed, leading to the collapse of the alveolus and causing **Acute Respiratory Distress Syndrome (ARDS)**.
- 7 If inflammation becomes severe, the protein-rich fluid can enter the bloodstream and travel elsewhere in the body, causing **Systemic Inflammatory Response Syndrome (SIRS)**.
- 8 SIRS may lead to **septic shock** and **multi-organ failure**, which can have fatal consequences.





# COVID-19 AND COMORBIDITIES

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# DO OUR GENES CONTRIBUTE TO SEVERE FORMS OF COVID-19?

Researchers from SU, together with collaborators, are investigating why some adults and children become very ill from COVID-19, while others experience little or no symptoms. This is likely not due to luck but rather our genetic material (DNA) that may contribute to disease susceptibility and severity.

It is especially important to perform genetic studies in South Africa, as researchers already know that the DNA of South Africans is representative of unique populations compared to that of other countries.

To do a human genetic study of COVID-19 susceptibility locally, researchers from various institutions are working together to collect the necessary samples for genetic analysis. The involved parties are SU's Divisions of Molecular Biology and Human Genetics, Haematology, Medical Microbiology, Medical Virology, and Paediatric Rheumatology and Immunology; SU's Department of Paediatrics and Child Health; the Centre for Proteomic and Genomic Research (CPGR); Artisan Biomed; the South African Medical Research Council (SAMRC) Genomics Centre; the University of Cape Town and the National Health Laboratory Service (NHLS).

The group of researchers are investigating the DNA of adults who have suffered from severe COVID-19 and of younger individuals who were diagnosed with multisystem inflammatory syndrome in children (MIS-C). They are particularly interested in families where several relatives have fallen ill, which might help them find the disease-associated genetic factors more easily. The scientists involved are using the latest genetic technology platforms to investigate the DNA of the study participants. They are also collecting the SARS-CoV-2

**WE KNOW THAT OUR DNA CAN CONTROL OUR IMMUNE SYSTEMS IN MANY WAYS. THIS COULD EXPLAIN WHY SOME PEOPLE HAVE LESS SEVERE SYMPTOMS WHEN THEY CONTRACT COVID-19.**

viral strain of the study participants, where available.

The researchers are using two approaches to study the DNA, one genome-wide and the other targeted.

At the SAMRC Genomics Centre, with the first sequencing platform of its kind in South Africa, they are using whole-genome sequencing to look at every part of a person's DNA sequence. At the CPGR, the researchers are investigating specific genetic marker changes in the DNA. They employ DNA microarrays, which are microscope slides that are printed with thousands of tiny spots in defined positions. Each spot containing a known genetic marker change is analysed on the GeneTitan platform, an automated instrument to analyse the microarrays.

To date, the researchers have banked more than 450 samples from individuals that tested positive for the virus at Tygerberg Hospital, and received the whole-genome sequencing data of 45 children with MIS-C and 11 individuals with severe COVID-19.

The researchers will be enrolling more study participants by inviting the general public to participate in a citizen science project through contributing their DNA to research. In citizen science, the general public participates voluntarily in the scientific process to address real-world problems.

If scientists can determine why and how human DNA affects the immune response against SARS-CoV-2, it might make it possible to predict who is more at risk of developing severe forms of COVID-19. Ultimately, it could lead to the development of new ways to combat the virus and alleviate the pandemic.

# TAKING STOCK OF COMORBIDITIES AND COVID-19

**DURING JUNE 2020, RESEARCHERS FROM SU WERE INVOLVED IN  
DEVELOPING AN EVIDENCE-BASED BRIEF ON COVID-19 AND DIABETES,  
HYPERTENSION, ASTHMA, OCCUPATIONAL LUNG DISEASES, CORONARY  
HEART DISEASE, HEART FAILURE AND STROKE.**

A brief was developed to inform the South African response to the pandemic, in the context of a country with multiple disease burdens, particularly chronic infectious diseases and non-communicable diseases (NCDs), and an already overstretched health system. A rapid review of international research and experiences of people with both NCDs and COVID-19 was conducted.

A comprehensive search of multiple databases was used that focused on the period 1 October 2019 to 20 June 2020. The researchers included 44 systematic reviews, 13 primary studies not included in the reviews and 26 ongoing studies. The systematic reviews and primary studies focused on the risk of severe COVID-19, hospitalisation and death from COVID-19, the impact of treatment, and prognostic markers. None of the systematic reviews or primary studies assessed the risk of new COVID-19 cases and screening for NCDs. None addressed occupational lung disease and few addressed asthma. A search was also done to identify relevant guidance documents.

The implications of the findings of this evidence brief need to be considered in the light of various issues, including South Africa's high rates of undiagnosed cases and poor levels of control of NCDs, especially diabetes and hypertension; the need for congruence with current guidelines for the management of these NCDs, such as the Adult Primary Care Guideline (APC), the APC-COVID and the World Health Organization's (WHO's) guidance on delivering evidence-based primary healthcare to people with NCDs; the draft National

Strategic Plan for the Prevention and Control of Non-Communicable Diseases (2020–25); and the overarching National Department of Health's plan to address the pandemic.

The *report*<sup>7</sup> was delivered to and discussed with the National Department of Health and presented during the Better Health Programme South Africa COVID-19 webinar. The theme of the webinar was evidence-based research on NCD comorbidities and COVID-19, and implications for policy and programming in South Africa. During this webinar, Prof Taryn Young from SU's Centre for Evidence-based Health Care and Department of Global Health provided an overview of the global evidence on NCDs and COVID-19.

The other researchers involved are Anel Schoonees (researcher, SU), Dr Anthony Lachman (clinician, University of Cape Town [UCT]), Dr Sebastiana Kalula (clinician, UCT), Smart Mabweazara (University of the Western Cape), Dr Ezekiel Musa (clinician, UCT) and Prof Naomi Levitt (UCT).

**A brief was developed to inform the South African response to the pandemic, in the context of a country with multiple disease burdens, particularly chronic infectious diseases and non-communicable diseases (NCDs), and an already overstretched health system.**



# RESEARCHERS UNRAVEL EFFECTS OF COVID-19 ON BLOOD CLOTTING

OVER THE PAST YEARS, THE BLOOD RESEARCH GROUP, UNDER THE LEADERSHIP OF PROF RESIA PRETORIUS FROM SU'S DEPARTMENT OF PHYSIOLOGICAL SCIENCES, HAS STUDIED BLOOD CELLS AND ABNORMAL CLOTTING IN VARIOUS INFLAMMATORY CONDITIONS.

The SU researchers involved in this project under Pretorius were researcher and technical officer Dr Chantelle Venter, PhD student Jandr  Bezuidenhout and four master's students (Corlia Grobler, Siphosethu Maphumulo, Mireille Grobbelaar and Jhade Bredenkamp).

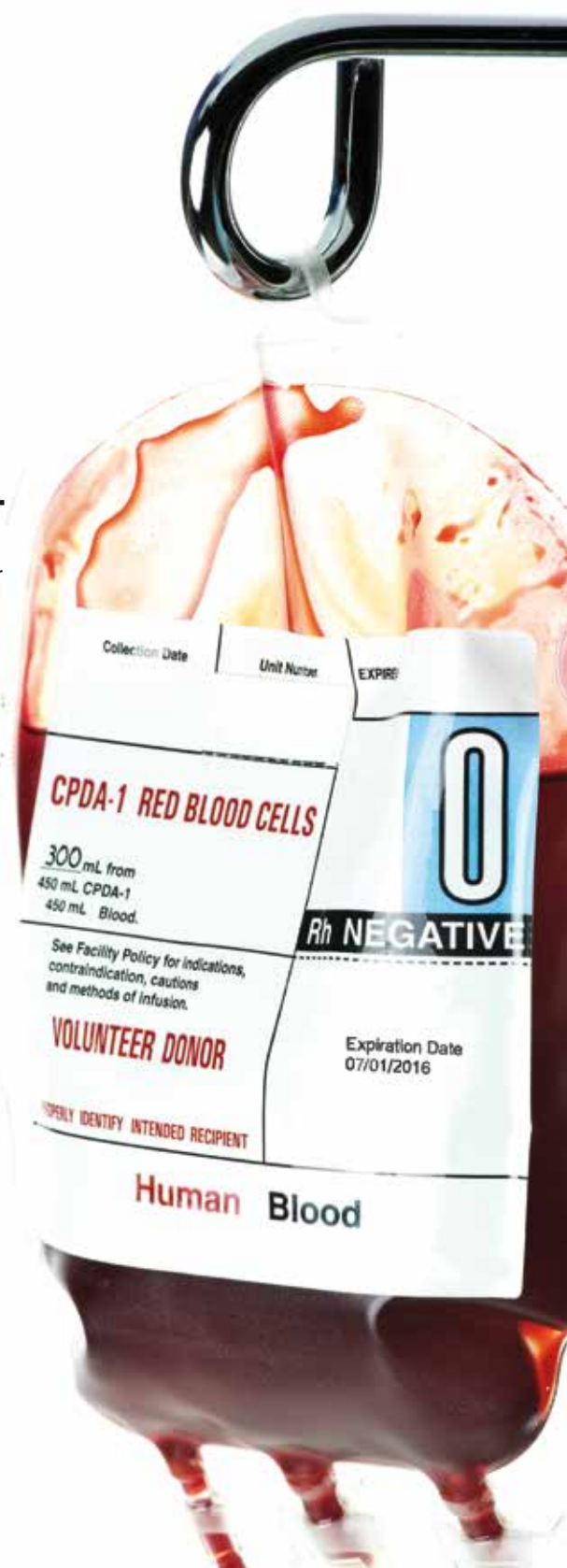
SU's researchers teamed up with clinicians from Mediclinic Stellenbosch (Drs Jaco Laubscher and Johan Laurens) and Pathcare (Dr Janami Steenkamp). Together, they focused on researching the effects of COVID-19 on the functioning of endothelial cells (the cells that line the inside of blood vessels), fibrin(ogen) (the main clotting protein circulating in blood), platelets (small cells that assist with blood clotting), and red blood cells (the cells that carry oxygen in the blood). In June, their first paper<sup>8</sup> on the topic (a review paper) was published in the *International Journal of Molecular Sciences*.

This was followed by a second paper<sup>9</sup> published in *Cardiovascular Diabetology*, for which the researchers studied clotting propensity in patients with COVID-19 and compared their results to that of healthy individuals and those with type 2 diabetes mellitus. Patients with this disease were included in the study because it is well known that these individuals are more prone to suffer from severe COVID-19 symptoms.

A third paper<sup>10</sup> was later published, also in the *International Journal of Molecular Sciences*. For this paper, the team studied the ultrastructure of platelets and red blood cells and circulating inflammatory biomarkers that are known to cause severe blood clotting in COVID-19 patients.

The SU researchers have shown that blood clotting commonly seen in COVID-19 patients shows pathology. It forms large deposits that may obstruct fine capillaries (tiny blood vessels). In addition, these deposits interfere with fibrinolysis, i.e. the body's process of breaking up clots that form in the body.

As type 2 diabetes mellitus is a significant comorbidity of COVID-19, exceptional care must be taken when patients suffering from this disease are diagnosed with the virus. Thanks to the team's results, scientists now have a better understanding of the effects of COVID-19. The results support the findings from other research groups that suggest that severe coagulopathies (blood clotting abnormalities) are central to the disease severity. Consequently, the team concluded that the prevention of coagulopathies will lie at the heart of successful therapies.





# RESEARCH AT DISTRICT HOSPITALS PROVIDES NEW INSIGHTS

**FAMILY PHYSICIANS AND THEIR CLINICAL TEAMS AT SMALL DISTRICT HOSPITALS THROUGHOUT THE WESTERN CAPE MADE AN INVALUABLE CONTRIBUTION TO THE FIGHT AGAINST THE CORONAVIRUS PANDEMIC. WHILE MUCH OF THE ATTENTION WAS ON INTENSIVE CARE UNITS IN TERTIARY HOSPITALS, THESE DISTRICT HOSPITALS (WITH LESS THAN 150 BEDS) SUPPORTED PRIMARY CARE AND TREATED MANY PEOPLE IN BOTH URBAN AND RURAL AREAS.**

South researchers evaluated patient characteristics, management and outcomes for COVID-19 at district hospitals in the Western Cape. Prof Robert Mash, Dr Mellisa Presence-Vollenhoven and members of SU's Family Physician Research Network in the Division of Family Medicine and Primary Care participated in this research. (The Family Physician Research Network is a group of family physicians in clinical and academic environments who collaborate on research projects to improve the quality of service delivery.)

The researchers' study<sup>11</sup>, published in the medical journal *BMJ Open*, looked at all patients with coronavirus who presented to the emergency centres of eight small district hospitals (four urban and four rural) between March and June 2020. Overall, the study included 1 376 people; most were in the City of Cape Town (74%), female (59%), middle-aged (mean age 46 years) and with comorbidities (67%) such as hypertension, diabetes or HIV.

Although patients were meant to enter the health system via primary care facilities, 71% of patients were self-referred, 49% came with mild disease and 42% were discharged home. This bypassing of primary care may be due to restricted opening times, de-escalation of services, messaging urging patients to stay away if possible, less visible testing at these facilities and peoples' fear of severe disease.

The most common symptoms were coughing (64%), shortness of breath

(52%), fever (32%), body pains (26%) and a sore throat (24%). The most common abnormal signs were a raised respiratory rate (51%), raised pulse (48%), raised blood glucose (44%), decreased oxygen saturation (42%) and raised systolic blood pressure (30%).

Overall, 47% of patients were admitted and because the turnaround time for the laboratory result was longer than hospital admission, most were treated as people under investigation or suspected of having coronavirus. Limited laboratory capacity during the first wave was a major problem. District hospitals were able to provide oxygen treatment, proning (treatment in the prone, face-down position to improve lung functioning), steroids and anticoagulation medication, as well as antibiotics.

They were not equipped at this level of care to provide intubation and ventilation on an ongoing basis and had no intensive care facilities.

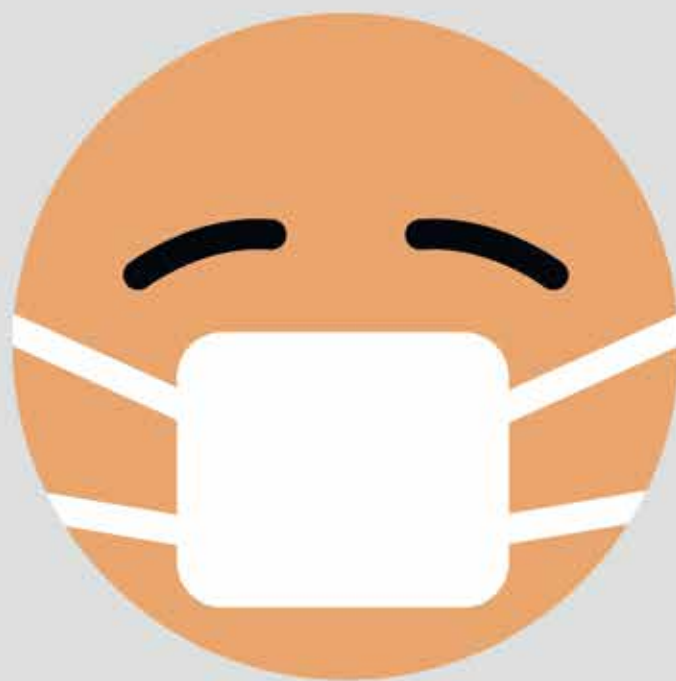
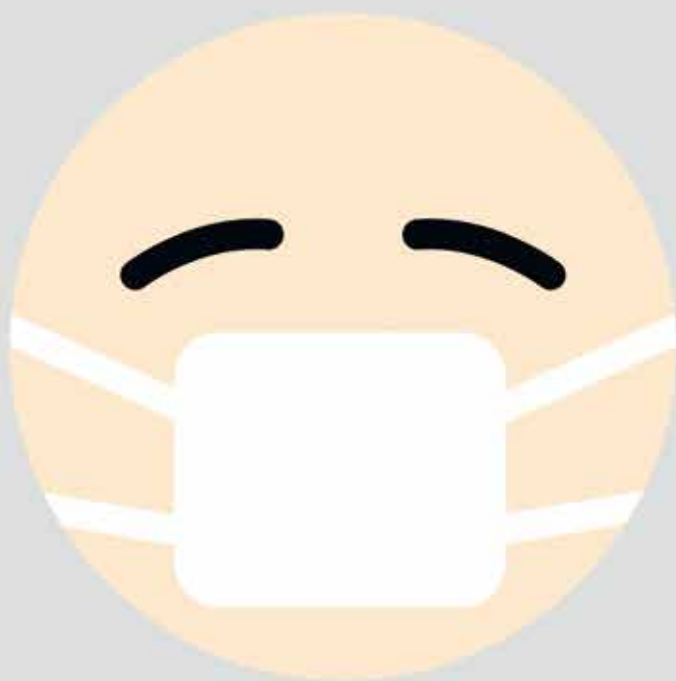
Of those admitted, 50% were discharged home, 9% transferred to higher levels of care, 5% to assisted isolation and 14% to field hospitals; 20% died. Mortality rates were similar to district hospitals in high-income countries.

Among those that died, a number of independent risk factors were identified. These factors include increasing age, male sex, being overweight or obese, type 2 diabetes, HIV and chronic kidney disease. Interestingly, pulmonary diseases (such as TB, asthma, chronic obstructive pulmonary disease and post-TB structural lung disease) were not associated with increased mortality. Among people with type 2 diabetes, poorer levels of control were associated with worse outcomes. Among people living with HIV, this was not the case.

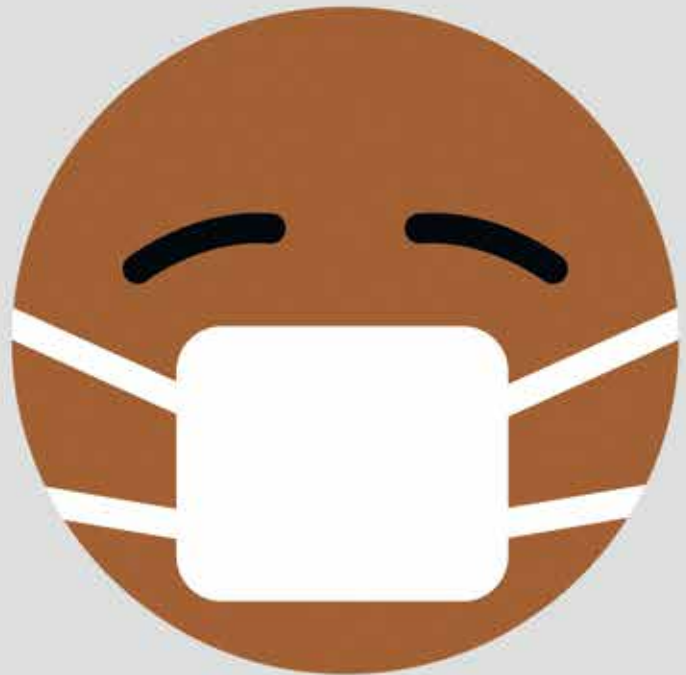
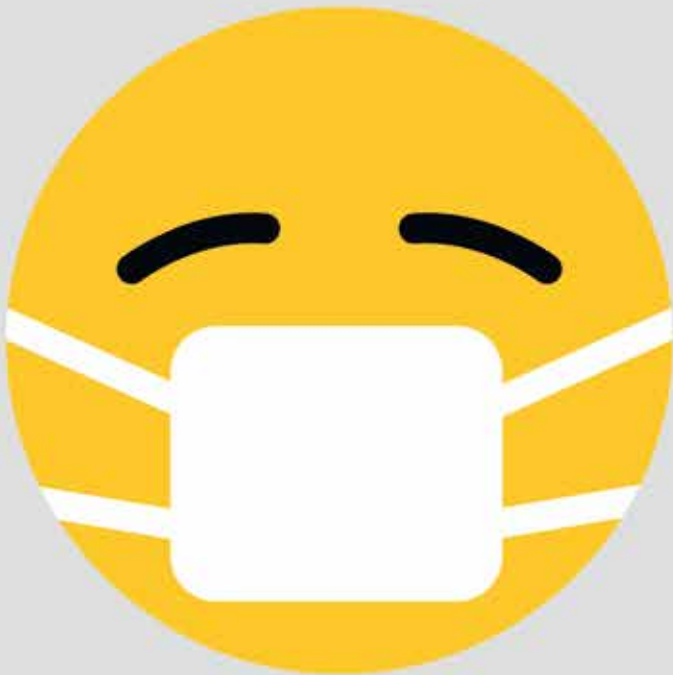
The pandemic has made us aware of the need to urgently tackle our problem of diabetes (one in four South Africans over the age of 45 years suffer from it).



# PROTECTING A NATION



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# WHAT THE 1918 SPANISH FLU CAN TEACH US ABOUT DEALING WITH COVID-19

A RESEARCH PROJECT AT SU THAT COMMENCED IN 2018, THE CENTENARY YEAR OF THE SPANISH INFLUENZA, HAS GAINED INCREASED CURRENT-DAY RELEVANCE WITH THE OUTBREAK OF THE COVID-19 PANDEMIC.

The study<sup>12</sup>, aimed at analysing the spread and severity of the 1918 Spanish flu, involves transcribing records of this pandemic in South Africa. These records – consisting of, amongst other documents, death certificates and news clips from 1918 – provide insights into how the flu spread, how the government tried to prevent the spread of the virus, and who died from the pandemic.

Prof Johan Fourie, a professor in economics at SU, heads the research team. While the purpose was not initially to compare the Spanish flu to other pandemics, Fourie says they have found some common trends between this pandemic of 1918 and the current COVID-19 pandemic.

“The information can help us understand why certain groups of people experienced higher levels of mortality than others. We found, for example, that black and coloured South Africans had poor access to medical care during the 1918 pandemic. One lesson for today is that we should dedicate enough resources to those people who already have poor

access to medical care, as they will likely be the ones to suffer the highest incidence of COVID-19,” says Fourie.

“The Spanish flu did not only expose those inequalities but also exacerbated them,” says Fourie. Compared to the three years before the flu, disadvantaged groups had far worse access to medical treatment during the Spanish flu. “This is why well-targeted medical interventions for the poorest in society are so critical,” explains Fourie.

## The story of Wills Bunu

One of the analysed records is that of the 18-year-old Wills Bunu and his family from Cimezile, a district south of Queenstown. They were among thousands of South Africans who died during October 1918, leading to the term ‘Black October’.

Wills and his family fell ill after some soldiers carrying the virus arrived in Queenstown after having fought in the First World War.

Black October ripped away five of Wills’ family members over five days, followed by Wills’ three-year-old sister, Canyiwe, and himself two days later. “This information shows, amongst other things, the deceased’s age, occupation, ethnicity, marital status, as well as the cause of death and how long the person had been ill,” says Fourie.

“Wills Bunu and his family’s tragic October may not have been for nothing. The preserved mortality records and the analysis thereof can help us learn from the past, specifically how the Spanish flu claimed thousands of lives,” says Fourie.

## Different government interventions

Other information originating from the analysis shows that the most vulnerable people had a higher mortality rate and that in some towns, such as Simon’s Town, the disease spread rapidly before reaching a plateau. Fourie explains that the spreading of the Spanish flu virus may have been related to the different local governments’ responses to the pandemic and what procedures they implemented to ‘flatten the curve’ and prevent the spreading of the virus. The information on the formal intervention processes of 1918 comes from local news reports of that time.

“As we transcribe more of these towns’ death records and collect more qualitative information that complements our data, we are going to get closer to the answer as to which government intervention was the most meaningful. This information can be of much use today,” says Fourie.

Fourie coordinates the Laboratory for the Economics of Africa’s Past (LEAP) and the Biography of an Uncharted People project, funded by the Andrew Mellon Foundation. LEAP is affiliated with SU’s Department of Economics and is devoted to the quantitative study of African economic and social history. The Biography of an Uncharted People project has enabled LEAP’s collaboration with the Department of History, thereby expanding their scope of work beyond economic history to include social, demographic, financial and family history.

The student researcher involved in the project is SU master’s student Jonathan Jayes. In February this year, Fourie and Jayes published their results in *World Development*, a leading development economics journal. Another paper that focuses on the economic consequences of the Spanish flu, authored by Fourie and Drs Dan de Kadt (University of California, Merced), Jan Greyling (SU), Elie Murard (SU) and Johannes Norling (Mount Holyoke, Massachusetts), is to appear in the *South African Journal of Economics*.

# STUDY TRACKS PANDEMIC'S EFFECTS ON CHILDREN

SCIENTISTS SAY THEY ARE ONLY STARTING TO LEARN ABOUT THE LONG-TERM OUTCOMES OF COVID-19 IN CHILDREN.

Children are less likely than adults to present with severe COVID-19-related disease and, consequently, are less likely to require hospitalisation or die from COVID-19.

Besides respiratory tract symptoms, children with COVID-19 do present with abdominal pain and diarrheal disease that may mimic appendicitis, seizures and a rare but serious multisystem inflammatory illness (MIS-C).

## COVID-19 in kids

A number of studies that looked at contact tracing found that the secondary infection rate in children was significantly lower compared to that of adults. "They seem less likely to be infected by contacts," says Dr Andrew Redfern of the Paediatric Emergency and Ambulatory Department at Tygerberg Hospital and SU's Department of Paediatrics and Child Health. However, less is known about the impact of different strains on infection rates in children, he points out.

Redfern adds that the overall case incidence worldwide demonstrates that children represent less than 10% of reported cases. Still, a large proportion of asymptomatic or mild disease in children may result in underreporting. Older children are at greater risk of infection. They are more likely to transmit to others compared to younger children who are at greater risk of severe disease. Nevertheless, children are very unlikely to die from COVID-19, and young children seem not to be superspreaders of the virus. The clinical presentation of children with lower respiratory tract infection does not seem to differ significantly between SARS-CoV-2 and other respiratory virus infections.

## Disentangling COVID-19 and MIS-C

Prof Helena Rabie from the Department of Paediatrics and Child Health and

an investigator in SU's COVID-KIDS project confirms that, although MIS-C is a serious condition that requires early recognition and management, global and local experience suggest good outcomes in the majority of children. These children are followed up at the Tygerberg Hospital cardiology and rheumatology service with Dr Barend Fourie, a paediatric cardiologist, and Dr Dee Abraham, a paediatric rheumatologist.

Rabie says that increases in the diagnosis of MIS-C were observed in the first and second wave of COVID-19. "As the cases increase locally, we can expect to see more cases of MIS-C," she says. She urges child health professionals to practice vigilance in identifying this disease spectrum and to create structured referral pathways to specialist centres. In addition, she says, paediatricians that diagnose MIS-C should continue to carefully evaluate children for surgical complications, including appendicitis and perforation, particularly if abdominal pain is a part of the presenting complaint.

This work also contributed to a report<sup>13</sup> summarising the first 23 cases of MIS-C treated at the Red Cross War Memorial Children's Hospital and the Tygerberg Children's Hospital, both situated in Cape Town.

## Focus on low- and middle-income countries

Dr Marieke van der Zalm, also from the Department of Paediatrics and Child Health, says that although children seem relatively protected from severe COVID-19 disease, limited data is available in low- and middle-income countries and sub-Saharan Africa.

"This is especially important as the under-five pneumonia mortality rate is significantly higher in our setting than in higher-income countries," she says. "Risk factors associated with poor outcomes in pneumonia such as HIV, TB and malnutrition could potentially have an important impact on COVID-19 outcomes. Our early data<sup>14</sup>, published in the journal *Clinical Infectious Diseases*, show that especially children under the age of one year required respiratory support and oxygen. This underlines the need to increase access to oxygen as this may be limited in some low- and middle-income countries, which could potentially drive morbidity and mortality." HIV infection was uncommon but a relationship between HIV exposure, tuberculosis and SARS-CoV-2 should be explored.

The prospective cohort of children with and without COVID-19 consists of 84 children to date. A total of 55 children have completed the three-month follow-up. The first one-year follow-ups were conducted in June 2021, the aim being to investigate 'long COVID-19' in children. The biorepository of this cohort includes saliva, serum and paxgene samples. Laboratory and data analysis is ongoing<sup>15</sup>.

**Children are very unlikely to die from COVID-19, and young children seem not to be superspreaders of the virus. The clinical presentation of children with lower respiratory tract infection does not seem to differ significantly between SARS-CoV-2 and other respiratory virus infections.**





# SPORT AND EXERCISE MEDICINE DURING PANDEMICS



**WHEN WE THINK OF A GLOBAL PANDEMIC SUCH AS COVID-19,  
WE USUALLY THINK OF PRIMARY HEALTHCARE, EMERGENCY MEDICINE  
AND THE FIELD OF VIROLOGY. IN MOST CASES, THE FIELD OF SPORT  
AND EXERCISE MEDICINE DOES NOT COME TO MIND.**

However, the Institute of Sport and Exercise Medicine (ISEM), based at SU's Faculty of Medicine and Health Sciences, has played a role in the research into COVID-19 and its implications for athletes, focusing on the return to sport following the pandemic.

Prof Wayne Derman, the director of ISEM, representing the International Paralympic Committee, is a member of a high-level international outbreak prevention task force that has developed a free online tool to help event organisers assess and mitigate the COVID-19 risk during endurance sports events. This task force is a collaborative body made up of various sports federations, including the International Institute for Race Medicine, World Athletics and the International Paralympic Committee.

This online infectious diseases outbreak management (IDOM) tool<sup>16</sup> was developed in record time by experts from some of the world's leading sports organisations, including World Athletics, the International Cycling Union and the International Institute for Race Medicine. The World Health Organization (WHO) was also involved in the project, in an observer capacity.

"The tool is intended to help organisers of sports events across the world assess the risk of staging an event, establish the preparedness of the local community and the event organisation for the risks of COVID-19, and clarify any necessary steps to further mitigate and reduce these risks," Derman explains regarding the IDOM tool that was launched internationally in mid-2020.

The tool is applicable and free of charge to all mass-participation endurance events, regardless of the sport, competition level and size. It outlines the mandatory mitigation measures to be undertaken by the event organisers, based on their particular

circumstances, as well as recommended and desired measures.

Dr Pierre Viviers, the director of SU's Campus Health Service and an honorary staff member at ISEM, worked together with colleagues at the South African Sports Medicine Association (SASMA) to publish a *position statement*<sup>17</sup> on the implications of COVID-19 for the resumption of sport in South Africa. This statement was crucial in guiding the safe return to sport in South Africa after the hard lockdown in March to April 2020 but still within the state of a continuing pandemic, in which sport-related activities, including training and competition, had been cancelled.

Apart from understanding how athletes can return to sport, it is clear that sport clinicians also need to determine the effect of COVID-19 on athletes and their health. ISEM, in collaboration with the team from the Sport, Exercise and Medicine Lifestyle Institute (SEMLI) at the University of Pretoria, is looking at the effects of COVID-19 on athletes.

This research is being conducted as part of the Athletes with Acute Respiratory Infection (AWARE) study, which aims to better our understanding of the effects of respiratory tract infections, including COVID-19, on athletes; the severity of the infections; and the impact of these infections on athletes as they return to training and competition. This will significantly contribute to the improved medical care of athletes and to the formulation of safe, evidence-based return-to-sport guidelines for athletes recovering from a respiratory tract infection. Data sets are still being collected for this AWARE-related study through the many collaborators on the project, including World Rugby, the Fédération Internationale de Football Association (FIFA), World Athletics and the International Paralympic Committee.

**The tool is intended to help  
organisers of sports events  
across the world assess the  
risk of staging an event,  
establish the preparedness  
of the local community and  
the event organisation for  
the risks of COVID-19, and  
clarify any necessary steps to  
further mitigate and reduce  
these risks.**

# COVID-19 VACCINES, FOOD SECURITY AND LEARNING LOSSES HIGHLIGHTED IN SURVEY STUDY

RESEARCHERS FROM RESEP (RESEARCH ON SOCIO-ECONOMIC POLICY) IN SU'S DEPARTMENT OF ECONOMICS CONTRIBUTED SIGNIFICANTLY TO WAVE 4 OF THE NATIONAL INCOME DYNAMICS STUDY – CORONAVIRUS RAPID MOBILE SURVEY<sup>18</sup> (NIDS-CRAM) THAT WAS RECENTLY RELEASED. THEY HELPED TO PRODUCE ELEVEN WORKING PAPERS<sup>19</sup> THAT CAPTURE THE FINDINGS OF THE DATA COLLECTED FOR THIS WAVE OF NIDS-CRAM, WHICH IS A BROADLY NATIONALLY REPRESENTATIVE SURVEY OF THE IMPACTS OF THE COVID-19 PANDEMIC ON SOUTH AFRICANS.



## VACCINES

**71%** of adult

respondents said they would get vaccinated if a COVID-19 vaccine was available.



## LEARNING LOSSES

**50-75%**

less learnt in no-fee primary schools in 2020 than in normal years.

As part of NIDS-CRAM Wave 4, data on vaccines, employment, schooling, hunger and early childhood development were collected between 2 February and 10 March 2021, and 5 629 successful interviews were conducted. A *synthesis report*<sup>20</sup> notes the findings in relation to certain topics.

Regarding **vaccines**, 71% of the adult respondents said they would get vaccinated if a COVID-19 vaccine was available. Those most at risk of contracting COVID-19 (i.e. those with chronic conditions and the elderly) were more willing than the general population to accept a vaccine. The youth (18–25 years) and those who trust social media as an information source were more likely to be vaccine hesitant.

Forty-two per cent of Afrikaans home language respondents were vaccine hesitant. This proportion is much higher than the national average of 29% and significantly higher than that of seven of the eleven language groups. Although NIDS-CRAM is not provincially representative, in light of the language results and the predominance of Afrikaans in the Western and Northern Cape, it is also clear that respondents from these provinces had higher vaccine hesitancy on average.

With regards to **learning losses**, South African primary school children in no-fee schools learnt 50–75% less



in 2020 than what they normally do. This statistic is based on assessment data from no-fee primary schools in Mpumalanga (130 schools, EGRS II) and the Eastern Cape (57 schools, Funda Wande) collected in 2020 and 2021 as part of independent evaluations of these programmes.

The results regarding the topic of **school feeding and rotational timetables** showed that less than half of South African children (43%) received free school meals in February and March 2021. This indicates that receipt is still well below pre-pandemic levels (65%), and even below November/December 2020 levels (49%). NIDS-CRAM Wave 3 (released November 2020) showed that the majority of parents and caregivers in South Africa (58%) agreed that children should be able to attend school every day, rather than follow the rotational timetables that are still in place in most no-fee schools.

An analysis of national teacher payroll data (PERSAL) showed that **teacher mortality** during COVID-19 was not related to school re-opening/closing dates, and instead closely followed the population's COVID-19 mortality trends.

Results related to **child hunger** showed that weekly child hunger declined from 16% in November/December 2020 to 14% in February/March 2021, although this new rate (12%) is still nearly double pre-pandemic levels (8%).

NIDS-CRAM respondents have been surveyed four times since the start of the pandemic. With regards to **food security**, two-thirds of respondents (67%) reported that their household ran out of money to buy food in the previous month in at least one of these surveys. Nearly half (47%) ran out at least twice. Among households with children in them, one-third (32%) reported that a child went hungry in the past week in at least one of the four waves of NIDS-CRAM. An analysis of hunger in Wave 1 (2020) showed that after controlling for race, gender, education and location, the strongest predictor of household hunger was whether the household had lost its main source of income.

According to the co-principal investigator of NIDS-CRAM and senior

researcher in ReSEP, Dr Nic Spaull, the survey results show that the effects of the pandemic are far-reaching and ongoing.

He says that while the focus of Wave 4 was on vaccines, they felt it was also important to foreground the extent of learning losses in South African schools.

"This was the first time that the results of independent assessments of primary school learning outcomes were available, reflecting on learning losses during 2020. What it shows is that children learnt 50–75% less in 2020 compared to 2019. This is devastating. We are also starting to see the flattening of learning trajectories.

"What most people don't realise is that learning losses are still growing even as we speak. More than 70% of South African schools are still practising rotational timetables where only 50% of kids go to school on any one day. That means that the other half don't get free school meals and continue to experience severe learning losses."

Spaull adds that the fact that teacher mortality rates were shown to be unrelated to school opening and closing dates is significant. "It suggests that schools are not sites of transmission and that all schools should fully reopen as quickly as possible."

Results from NIDS-CRAM Waves 1, 2 and 3 have influenced government decisions on a number of topics, including social grant roll-out, provision of school meals for children while schools were closed, as well as attempts to feed the hungry.

Researchers from the Universities of Cape Town, Johannesburg, the Witwatersrand and Pennsylvania, as well as the Department of Basic Education and the Human Sciences Research Council, contributed to NIDS-CRAM Wave 4.

Financial support for NIDS-CRAM is provided by the Allan & Gill Gray Philanthropy, the FEM Education Foundation and the Michael & Susan Dell Foundation. The Southern Africa Labour and Development Research Unit at the University of Cape Town is responsible for data collection and quality control.



## FOOD SECURITY

**67%** of

respondents reported that their household ran out of money to buy food in the previous month in at least one of these surveys.



## CHILD HUNGER RATE

**12%** in March 2021:

almost double pre-pandemic levels (8%)



# ELECTRON MICROSCOPY CONTRIBUTES TO LOCAL PRODUCTION OF PERSONAL PROTECTIVE EQUIPMENT (PPE)

ONE OF THE MAIN REASONS FOR THE STRICT LOCKDOWN REGULATIONS IN SOUTH AFRICA DURING THE INITIAL PHASES OF THE COVID-19 PANDEMIC WAS TO PREVENT THE OVERCROWDING OF HOSPITALS AND PROVIDE THEM WITH TIME TO PREPARE FOR THE EXPECTED INFLUX OF PATIENTS AS TRANSMISSIONS PEAKED. OVER TIME, IT BECAME APPARENT THAT THIS PREPARATION MAINLY CENTRED AROUND ONE CRITICAL ELEMENT – THE PROCUREMENT OF PERSONAL PROTECTIVE EQUIPMENT.

In light of these events, the Electron Microscopy Unit at SU's Central Analytical Facilities (CAF) is providing critical electron microscopy analytical support to the Stellenbosch Nanofiber Company (SNC), which is in the process of manufacturing reusable filters for medical-grade face masks.

## The growing need for PPE

Continuous provision of PPE to healthcare workers is of paramount importance in the fight against the COVID-19 pandemic. PPE constitutes a range of products, including gloves, face shields, surgical gowns and face masks. Healthcare workers come into contact with multiple patients per day and therefore require certified equipment to serve as an effective barrier between them and their patients. PPE is such a barrier – it not only prevents healthcare workers from becoming carriers of the novel coronavirus but also prevents hospitals from becoming transmission 'hotspots', which can result in their closing.

The reality, however, is that many countries are struggling to provide frontline healthcare workers with adequate PPE due to the increased global demand, and South Africa is no exception.

In response to these shortages, many local manufacturers have repurposed their production lines to manufacture various forms of PPE for general public use. The difficulty with mass-producing medical-grade PPE, however, is that manufacturers must be certified by the government to produce medical equipment, and then adhere to the

strict guidelines of the International Organization for Standardization (ISO).

## Developing reusable face masks

SNC, one of the few companies in SA certified to produce advanced biomedical nanofibre materials, is a prime example of a company specialising in the commercial-scale manufacturing of these materials.

Nanofibre materials have extremely versatile biomedical applications, including wound dressing, drug-release materials and cell culture scaffolds. In response to the growing demand for PPE, SNC is currently working on the production of the most important part of medical-grade face masks: the filter layer.

What is unique about SNC's filter layers is that they physically entrap and immobilise viral particles as opposed to conventional melt-blown polypropylene layers that electrostatically trap particles. This might seem like a small difference, but it allows for the nanofibre-based filters to be washed and reused,

whereas the electrostatic properties of the polypropylene-based filters diminish with each wash. Essentially, SNC's filter layers may help reduce the constant demand for new PPE.

## New microscope enables necessary analysis

To confirm whether these filter layers are capable of entrapping nanoscale particulates and to assess how robust these nanofibres are, scanning electron microscopy (SEM) analysis is required to measure the distance between fibres as well as the fibre size. This makes SEM analysis integral to the production of nanofibre-based filter layers.

The ThermoFischer Apreo VolumeScope SEM is the newest addition to the CAF Electron Microscopy Unit and has been integral to SNC's performing of this much-required analysis. Although the main purpose of the Apreo is to function





as a serial block-face microscope, capable of acquiring 3D volumetric electron microscopy datasets, it is also a very capable scanning electron microscope for general image acquisition, which makes it an extremely versatile tool.

The procurement of the Apreo coincided with the appointment of a new CAF staff member, Dr Jurgen Kriel. He was appointed in March 2020 to provide SEM analytical services to medical researchers at Tygerberg Campus. Although the national lockdown put a hold on many research projects, the Apreo continued running to provide industry clients such as SNC with essential analytical services. However, these services are not provided without risk. Being near Tygerberg Hospital had its inherent dangers at a time when this hospital had the highest number of confirmed COVID-19 cases in the Western Cape in April 2020.

Safety guidelines are of paramount importance, not only for the safety of employees but also for that of their families. "It was quite a difficult decision to go back to work. Right before the Level 5 lockdown was imposed, my mother started chemotherapy. As much as I wanted to help SNC, I also did not want to place my family in harm's way. My manager at CAF, Madelaine Frazenburg, was very understanding and left the decision up to me. Having a vulnerable family member really puts the importance of adhering to the safety guidelines into perspective. After I decided to help SNC, I was very relieved to see how well everyone on Tygerberg Campus adhered to these guidelines," Kriel says.

Until a vaccine has been administered to a sufficient portion of the population, the demand for appropriate PPE will remain high. Being able to reuse medical-grade face masks will alleviate the financial burden on hospitals significantly. "Various tests have demonstrated the robustness of the filters and have shown that we maintain filtration efficiency even after 10 cycles of submersion in boiling water for 10 minutes and air drying," says Dr Megan Coates, the research and development manager at SNC.

SNC has since built partnerships for further production of face masks after completing the tests on the filter layers.

## SU SCIENTIST DEVELOPS TEST FOR FACE MASK FABRIC EFFICACY

**TEXTILE SPECIALIST ADINE GERICKE FROM SU'S DEPARTMENT OF CHEMISTRY AND POLYMER SCIENCE HAS DEVELOPED A STANDARDISED TEST FOR USE BY THE CLOTHING AND TEXTILE MANUFACTURING INDUSTRY TO EVALUATE THE EFFECTIVENESS OF TEXTILE FABRICS AND FILTER MATERIALS USED IN FABRIC FACE MASKS.**

The test method is based on the World Health Organization's (WHO) guidelines, published on 29 March 2020, and relies on the latest evidence that the COVID-19 virus, in microdroplet form, appears to largely exit infected individuals through the mouth when they talk, cough or sneeze. It is, therefore, believed that fabric masks can play an important role in reducing the community transmission of the virus.

Gericke, one of only a handful of textile specialists in South Africa, was directly involved in updating the Department of Trade, Industry and Competition's *guidelines for fabric masks*<sup>21</sup>, published online on 29 April 2020. In South Africa, not wearing a mask in a public space became a criminal offence in July 2020.

She says the effectiveness of fabric face masks can be greatly improved by the selection of an optimum combination of fabric layers. "Masks typically consist of two to three layers of fabric, which could include a filter layer in the middle. Each layer contributes to the performance properties of the end product. Fabrics can be tested in single layers or in combinations, according to the design of a specific mask."

But while a mask should act as a barrier, it must not block airflow. If a person cannot breathe normally while wearing the mask, this will lead to the mask being removed or frequently touched by the wearer, Gericke warns.

Since the start of the lockdown in March 2020, she has been testing a range of textiles and non-woven materials for the industry. "Textiles are deceptive. One cannot just assume that one material will perform better than another simply because it is, for example, thicker than the other."

For home sewers, her advice is fourfold. Firstly, use two but preferably three layers of fabric to stop microdroplets. Secondly, try to include a 'filter layer' in the middle (such as interfacing or any lightweight, stiff fabric), as it will significantly increase barrier efficiency. Thirdly, the mask must be comfortable, especially if it is going to be used in the workplace. Some fabrics have good barrier efficiency but might have very low air permeability. Test your design by wearing the mask for at least 30 minutes (a five-minute test is not enough) to make sure your combination of fabrics does not restrict breathability, build up heat or cause irritation to the extent that you need to remove the mask. Her final piece of advice is to experiment with different fabrics until you find the right combination.

Gericke says it was hugely gratifying to do research that holds an immediate and practical benefit for society. "Most of the manufacturers I've worked with are committed to manufacturing face masks that are functional and made from locally-produced fabrics, and take care to select the best fabrics for the masks."



# MATIES 3D PRINT PROTECTIVE GEAR FOR FIGHT AGAINST CORONAVIRUS

**WHEN THE DIVISION OF ORTHOPAEDIC SURGERY AT SU STARTED A 3D PRINTING LABORATORY IN 2018 TO ASSIST SURGEONS IN PLANNING AND REHEARSING SURGICAL PROCEDURES, THEY HAD NO IDEA THE LAB WOULD BE PUT TO USE IN A PANDEMIC.**

Yet, that is what happened in March 2020 as staff, students and community volunteers worked long hours to 3D print and assemble protective visors to be distributed to those working on the frontline of the war on COVID-19.

Dr Rudolph Venter, an orthopaedic surgeon and lecturer in clinical anatomy at SU's Faculty of Medicine and Health Sciences (FMHS), devised the idea after the virus broke out in South Africa.

"I thought: Why not put the 3D printing lab to good use by producing some kind of protective gear for the healthcare workers working with COVID-19 patients?" says Venter. During consultation with Tygerberg Hospital management, face shields were identified as an immediate need.

"There is a burgeoning community of people all over the world using 3D printers and laser cutters to produce equipment for healthcare workers, sharing designs and refining them, all being shared freely online. It is beautiful to see," says Venter.

He and his team downloaded a freely available design that met a range of different criteria, and started sourcing the material to make them.

"The headgear comprises a plastic headband to which you attach a clear visor, with elastic to attach it to the wearer's head. We approached local suppliers – including Maizey Plastics, who donated and sold sheets of clear plastic and elastic – and used a few rolls of 3D printing filament that we had in stock in our lab," says Venter.

## It takes a community to fight a pandemic

The head of the Division of Orthopaedic Surgery, Prof Jacques du Toit, made funding available to purchase some of the materials. A generous SU Social Impact grant also allowed for the purchasing of a second 3D printer.

"We soon realised that we were not going to make much of a difference with just one printer, so we approached SU's Faculty of Engineering and Prof Kristiaan Schreve from the Department of Mechanical and Mechatronic Engineering, who very graciously put all the 3D printers they could spare at our disposal," says Venter. Facial mask headbands for the medical staff at Tygerberg Hospital were 3D printed in the Department of Mechanical and Mechatronic Engineering and the Department of Industrial Engineering during the early stages of lockdown.

Kevin Neaves, chief technical officer in the latter department, played a key role in the 3D printing of the headbands. "We printed more than 500 headbands," he says. "This works out to over 7 km of filament and well over 1 000 hours of printing time."

It was not long before Venter also had a network of community volunteers and companies, including De Beers Marine, producing the same design on their home 3D printers. A local engineering firm, Rapid 3D, donated 10 more rolls of filament and consumables for the printers being used. Another donation was from the head office of the independent school network Curro, which donated 20 more of the visors.



Venter next roped in Luné Smith, a fifth-year medical student who, along with fellow student Abdul-Mutakabir Aziz, helped set up a student-volunteer initiative when the pandemic broke out in South Africa. Hundreds of medicine and health sciences students at the FMHS opted to use their recesses to play their part in fighting the virus.

Smith runs the WeFightBack COVID committee, which is involved in various



student-volunteer projects, including a community mask initiative, the making of spacers for metered-dose inhalers, a support project for people in kangaroo mother care wards and lodger areas, and an education initiative relating to the virus.

Smith and her team took over the logistics of the 3D printing project on top of their other projects. She says it feels “surreal” to be working together

in the midst of a pandemic and that the camaraderie among the students and staff has been “beautiful” to witness.

“We are a country that’s spent enough time hurting one another. We’re now at a place where we are caring about and helping one another. This pandemic is making us face the problem together. We are all the same. It feels right,” she says.

To date, the collaboration between WeFightBack COVID and the Division

of Orthopaedic Surgery’s 3D printing laboratory has manufactured more than 1 500 face shields, as well as hands-free door openers for high-traffic areas.

# FINDING THE BEST TREATMENT FOR COVID-19 PATIENTS

**THE PANDEMIC REACHED SOUTH AFRICA IN MARCH 2020, AND THE NATIONAL ESSENTIAL MEDICINE LIST COMMITTEE OF THE DEPARTMENT OF HEALTH ESTABLISHED A SPECIAL SUBCOMMITTEE WITH THE PURPOSE OF DECIDING ON THE BEST METHODS AND MEDICINES TO TREAT COVID-19 OR PREVENT PEOPLE FROM GETTING THE DISEASE.**

One of the proposed medications for treating patients with COVID-19 who require hospitalisation is colchicine (a medication for pain and inflammation, often used to treat gout).

As the subcommittee needed to consider all available evidence from research done globally and make quick decisions in the face of an urgent need for treatment options, a team from SU's Centre for Evidence-based Health Care (CEBHC), the South African Centre of Excellence in Epidemiological Modelling and Analysis (SACEMA) and the South African Medical Research Council's Cochrane South Africa assisted in conducting a rapid review of the evidence.

The team gathered, from three comprehensive databases, all evidence of the use of colchicine for the treatment of COVID-19 in patients needing hospitalisation. They included all research articles, both published and in the pre-print stage, that answered the research question "Should colchicine be used for managing patients with COVID-19, with or without other medicines?" Where results had not yet been summarised, the team combined the findings into a single summary.

The report on this evidence synthesis was further strengthened by inputs from clinicians serving on the subcommittee, who used the evidence to formulate the committee's recommendations.

The initial rapid review was done in August 2020 and provided very uncertain results. The subcommittee used this evidence, current until October 2020,

to advise strongly against the use of colchicine for treating COVID-19 in patients who need to be hospitalised, outside of a clinical trial setting<sup>22</sup>.

In three randomised controlled trials that answered the research question and were included in the update, it was found that adverse reactions were more likely to happen in patients treated with colchicine. There were no significant differences in the mortality, clinical worsening or length of hospital stay between patients who received colchicine and those who did not.

In October, the subcommittee requested from the team an update of the rapid review as new research had been published. This *update*<sup>23</sup> was made available in February 2021.

As this pandemic is still unfolding, there is a continuous emergence of new evidence. Therefore, *rapid reviews*<sup>24</sup> will be updated as more relevant research is published and recommendations will be revisited as necessary.

SU researchers involved in this work include Dr Michael McCaul (Centre

for Evidence-based Health Care), Dr Amanda Brand (South African Grading of Recommendations Assessment, Development and Evaluation (GRADE) Network), Ameer Hohlfeld and Dr Olatunji Adetokunboh.

This work was partly supported by the Research, Evidence and Development Initiative (READ-It) project, which is funded by the UK government.

## Research supports policy decisions

On Thursday the 5<sup>th</sup> March 2020 the first COVID-19 case was recorded in South Africa and policymakers needed good quality evidence urgently to help prevent and treat COVID-19. We needed to make quick decisions based on the best available evidence in a timely way. Our project, led by the National Essential Medicine List Therapeutics Subcommittee in collaboration with the SA GRADE Network developed rapid reviews to inform national COVID-19 treatment guidelines.

We used a rapid review process that balanced urgency with rigorous methods. We used the GRADE evidence to decision framework that provided transparent and robust recommendations, allowing for further strengthening of health systems and building capacity in evidence synthesis. These evidence-based rapid reviews were timely and pro-active, many of them being conducted in less than 14 days. They also drew on existing living systematic reviews or guidelines, not duplicating effort and thus being efficient in using our limited resources.

**As this pandemic is still unfolding, there is a continuous emergence of new evidence. Therefore, rapid reviews will be updated as more relevant research is published and recommendations will be revisited as necessary.**



# SU RESEARCHERS TURN BREAD INTO HAND SANITISER

**MATIES FOOD SCIENTISTS MADE 18 LITRES OF ALCOHOL-BASED HAND SANITISER FROM STALE BREAD**

**CRUMBS IN THEIR IN-HOUSE FERMENTATION TANK. AFTER A WEEK-LONG PROCESS, THEY WERE ABLE**

**TO BOTTLE THE END PRODUCT HOURS BEFORE SOUTH AFRICA WENT INTO LOCKDOWN IN MARCH 2020**

**BECAUSE OF COVID-19.**

Staff and postgraduate students from the Department of Food Science were able to take a good supply of hand sanitiser home. A few bottles were left in the Food Science building for people to use during authorised staff visits to the facility to monitor experiments.

“It smells just a little bit like toast,” recalls Dr Stefan Hayward, a postdoctoral researcher in the Department at the time. He has since joined the Department as a member of staff and is part of a research group that focuses on ways to reduce food waste and put byproducts to use.

He explains the rationale behind their efforts as follows: “Waste implies a need to discard something that has become useless and needs to be disposed of. We see wasted food products not as pure waste but as raw ingredients, or byproducts, that can provide the impetus to invent new ways of reducing, reusing and recycling.”

The plan to make their own hand sanitiser came a day after the Presidency of South Africa announced social distancing measures, during a brainstorming session between Hayward, another postdoctoral researcher, Dr Timo Tait, and a PhD food science student, Sebastian Orth.

“We were talking about alternative uses for some of the everyday items we often discard, bread being one of them,” recalls Hayward. One thing led

to another, and they decided to produce bioethanol from bread to make hand sanitiser.

“Bread is composed of at least 40% starch, which can be used as an excellent carbohydrate source during the production of bioethanol via fermentation,” explains Hayward.

The pandemic has highlighted the need for better hygiene practices and adequate supplies of antiseptic products such as hand sanitiser to help ‘flatten the curve’, he says.

They knew they would have no problem finding their main ingredient because unsold bread past its sell-by date is generally returned to distribution centres from where it is discarded as waste or, at best, used as animal feed.

The researchers were able to obtain dried bread crumbs from one of their industry partners, Innovative Research Solutions (IRS). IRS, in turn, is currently helping Pepsico (formerly known as Pioneer Foods) make something worthwhile out of the large amounts of bread returned daily to its distribution centres. The idea is to convert this waste stream into functional ingredients that can be put to a different use.

## **From starch to ethanol**

In the Department’s fermentation tank, they combined 60 kilograms of bread crumbs with hot water and added to the mix amylases, which are regularly used in the food industry. Amylases are

starch degrading enzymes which convert plant starches, which are ‘sugar’ storage molecules, to fermentable sugars. The researchers then adjusted the pH level of the bread and water mixture to optimal levels for converting starch to sugar. Next, the mixture was incubated at 65°C for 60 minutes to enable saccharification (the enzyme-catalysed conversion of starches to sugar). After that, the mixture was cooled to 30°C before a specialised yeast strain used by the distilling industry was added.

The end product, which looked like mashed potatoes, was left at room temperature for seven days until the fermentation process was complete and they could start distilling the mixture.

From the initial 60 kilograms of bread in their first batch, they produced 10,5 litres of liquid containing 75% ethanol. Using a recipe found on the internet, this solution was combined with ingredients such as glycerol, hydroperoxide (a chemical compound that kills viruses and bacterial spores) and a denaturant (an additive that discourages recreational consumption) to ultimately make 18,2 litres of hand sanitiser.

“We were able to satisfy our scientific curiosity around whether or not we would be able to ferment bioethanol from bread,” says Hayward.



*Sorry!*

CLOSE

# SOCIO-ECONOMIC IMPACTS OF THE PANDEMIC

WE'RE  
SED

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# COMPASSION VERSUS GUILT AS DRIVERS OF STRUCTURAL REFORM DURING THE PANDEMIC

ACROSS THE GLOBE, THE HIGHLY UNEQUAL IMPACT OF THE COVID-19

PANDEMIC HAS EXPOSED RACIALLY UNEQUAL SOCIETIES.

In South Africa, some argue, the pandemic has highlighted the true extent to which white South Africans and their descendants continue to benefit from centuries of systemic racialised privileging. For example, the glaring divides in terms of digital access, home conditions and sustainable income between black communities in township settings and those in mostly white suburbs have been forced into view unequivocally.

While the media showed a greater articulation of white privilege during the lockdown, it is unclear whether the pandemic actually shifted white acknowledgement of present-day racialised inequalities. Dr Melike Fourie and Dr Wilhelm Verwoerd, both from the Studies in Historical Trauma and Transformation group in the Department of Psychology, decided to explore whether and how the COVID-19 disruption to public life has shifted white people's perceptions in terms of their acknowledgement of ongoing structural racism, their historical implication in and privilege as beneficiaries of apartheid injustices, and their personal support towards measures of redress (i.e. social justice). Or, the researchers asked, did the pandemic strengthen a culture of paternalistic emergency relief? (Whereas charitable giving is typically a short-lived response that reinforces the dependency of marginalised communities, a desire for justice may lead to longer-term material change towards a more equal society.)

Central to Fourie and Verwoerd's study was the desire to understand which affective reactions motivated participants' responses to 'black hardship' during the pandemic. This hardship includes the structural barriers to adhering to and surviving COVID-19 lockdown restrictions. The researchers anticipated that compassion and moral emotions,

such as guilt and righteous anger, would be pivotal in supporting social reform. While compassion is associated with prosocial behaviour (voluntary actions intended to benefit others), various studies have reported on the potential of collective guilt, when experienced by members of historically advantaged groups, to motivate support for affirmative action and restitution.

## White guilt as a catalyst, for now

The researchers collected survey data from a national sample of 400 white South Africans (with a mean age of 35 years) between 12 June and 12 July 2020. This was in the aftermath of the South African COVID-19 hard lockdown, during which citizens were forced to stay home. When compared to similar data collected before the pandemic, 2020's data suggest that the pandemic served as a natural intervention in increasing white acknowledgement of structural racism and support for redress.

Indeed, greater observations of socio-economic inequality during lockdown were significantly associated with raised awareness of historical implication and privilege, as well as with guilt. Furthermore, as anticipated, compassion was the emotion most highly expressed by participants. Feelings of guilt, however, were the unique predictors of heightened

perceptions of structural racism, support for redress policies and social justice motivation; compassion predicted only charity motivation. These results suggest that 'white guilt' can be much more consequential than compassion in contributing to social reform.

Various scholars have raised concerns about the appropriateness of guilt, as a self-critical emotion, in response to the legacies of oppression in post-colonial and post-slavery contexts. Fourie and Verwoerd agree that white guilt might become a public 'performance' that provides selfish relief from incriminatory or unsettling feelings, rather than disrupting the structural systems that sustain racial inequality. However, they also believe that, unlike compassion, private guilt is imbued with a sense of responsibility for past injustices that provides the impetus for social redress. Guilt, in this context, might therefore be understood as emanating not only from the collective misdeeds of white people under apartheid but also from the acceptance of and continuous enjoyment of unearned material benefits in the present, especially during the lockdown.

With the easing of lockdown conditions, it became evident that neither increased compassion and charity nor guilt-driven changes in political awareness and acceptance of historical responsibility, are likely to be sustained. Fourie and Verwoerd, therefore, contend that for genuine compassion and guilt to become 'unsettling' beyond immediate crisis conditions, individuals must combine these feelings with the deliberate cultivation of capacities – through intrapersonal and intergroup relational processes – to translate their motivational push into sustainable commitments to promoting social justice.

**With the easing of lockdown conditions, it became evident that neither increased compassion and charity nor guilt-driven changes in political awareness and acceptance of historical responsibility, are likely to be sustained.**



# TAX RELIEF STRATEGIES FOR RECOVERY

**ACROSS THE GLOBE, MANY GOVERNMENTS WERE FORCED TO LOCK DOWN THEIR COUNTRIES IN AN ATTEMPT TO CURB THE SPREAD OF THE COVID-19 PANDEMIC. SOUTH AFRICA WAS NO EXCEPTION.**

This stalled – if not brought to a halt – economic activity, resulting in a loss of income for businesses, workers (both in formal and informal sectors) and the self-employed. In response, governments worldwide have implemented economic and tax relief packages to help businesses and workers mitigate the economic impact of the pandemic. The use of these tools varies across countries, making direct comparisons difficult.

In a research piece for *The Conversation*<sup>25</sup>, Dr Lee-Ann Steenkamp, senior lecturer in taxation at the University of Stellenbosch Business School (USB), sifted through the various tax relief options used globally to identify ideas that could serve as useful examples for policymakers, especially those in South Africa. These options were distilled into three groups, discussed below.

Garnering over 200 000 views, Steenkamp's contribution was the most-read article on this platform by a SU author during 2020.

The first type of tax relief measure involves extending immediate financial aid to taxpayers through a cash payment from the revenue authority. It can take the form of a grant, subsidy or contribution from the government. One example of this type of tax relief is the US\$2 trillion economic relief package for the United States proposed by (then) president Donald Trump.

In Germany, a state-funded programme dating from World War II and used to great effect during the 2008 financial crisis was again implemented. The principle of short-time work ('Kurzarbeit') is aimed at helping

companies navigate difficult periods without having to resort to large-scale lay-offs, thereby disrupting business and, ultimately, the economy.

A tax holiday is a period of time during which the collection of a certain type of tax is suspended, reduced or postponed. The UK, for example, waived business property taxes for retail, hospitality, leisure and nursery businesses for 12 months. Italy extended tax deadlines for residents and companies in the so-called 'red zones' of the country. Spanish small and medium enterprises (SMEs) and self-employed people were allowed to defer income, corporate and VAT tax obligations for six months, with the first three months not being subject to interest.

Other categories of tax relief can be loosely grouped as 'reduced tax rates' and 'tax credits' (or 'rebates'), which decrease the taxpayer's calculated tax liability, resulting in less tax being owed to the revenue authority.

In Italy, businesses received a 50% tax credit for sanitation expenditure, e.g. the costs of daily cleaning services, masks and other precautionary measures to curb the spread of the virus.

Many countries reduced value-added tax (VAT) rates or introduced exemptions. For example, China introduced a VAT exemption on 'lifestyle services'. This includes medical, catering, accommodation and personal services (such as hairdressing). Norway temporarily dropped its VAT rate from 12% to 8% and postponed VAT payments. Greece also lowered VAT on products related to the prevention of the spread of the virus.

"For their part, exemptions, deductions and allowances all have the effect of reducing the taxable amount on which a tax is levied. Ultimately, it results in less tax being paid, but this benefit may not be felt immediately. These forms of tax relief don't put an instant strain on government funds, but they also don't offer the same speedy cash flow assistance to taxpayers as direct payments or tax holidays, for example," Steenkamp explained.

Her article concluded with a brief look at the South African tax support initiative proposed at the time and her suggestions for additional tax relief measures.

VAT REDUCTIONS  
SUBSIDY  
EXEMPTIONS  
DEDUCTIONS  
ALLOWANCES  
GRANTS  
TAX HOLIDAY



# REHABILITATION IN THE TIME OF COVID-19

SINCE MARCH 2020, THE PANDEMIC HAS HAD A DISRUPTIVE EFFECT ON  
THE REHABILITATION SERVICES OF PATIENTS WITHOUT COVID-19.

Two researchers from the Division of Occupational Therapy collaborated with 14 rehabilitation practitioners working in public health facilities to capture experiences related to providing rehabilitation services during the COVID-19 pandemic.

Data collection comprised in-action reflective journaling by frontline rehabilitation clinicians (such as occupational therapists, occupational therapy technicians, physiotherapists, physiotherapy assistants, speech therapists, audiologists and podiatrists) to capture their experiences and insights.

The project employed a sequential critical reflection design. Reflective journaling, capturing critical moments in rehabilitation service delivery, was done for six months during 2020. In addition, an inductive content analysis was done to identify the barriers and facilitators that shaped rehabilitation services.

The findings revealed the impact of COVID-19 on rehabilitation services in the public healthcare sector. Its wide-ranging consequences included families and caregivers, rehabilitation clinicians and services, and the integrity of the rehabilitation system. The main themes that emerged showed how disorder and confusion caused by the pandemic have impacted on rehabilitation services and those offering the services.

The importance of the rehabilitation team and leadership emerged as strong themes. Other themes included reflections on having to work in a new way, working beyond the professions' scopes of practice, and pandemic fatigue. The pandemic led to a reappraisal of rehabilitation services at policy and service level.

The essential need for rehabilitation services in our society was confirmed as the consequences of discontinued rehabilitation services became evident.

The use of effective leadership, clear communication, dependable multidisciplinary teams and robust personal resources were strategies that supported rehabilitation clinicians while working in the time of COVID-19. Findings provide practice-based evidence that can be used to establish and strengthen the role of rehabilitation and its service to public healthcare users.

# DATA OR BREAD? STUDENT EXPERIENCES OF LEARNING UNDER LOCKDOWN

**THE RESPONSE OF MANY SCHOOLS TO THE PANDEMIC-ENFORCED LOCKDOWN OF 2020 CAME IN VARIOUS FORMS OF ONLINE LEARNING.**

Prof Jonathan Jansen from SU's Department of Education Policy Studies performed a policy analysis of student experiences of online learning by focusing on emergent themes in more than 600 student stories. These themes included the educational and emotional costs of lockdown learning and what this means for immediate and long-term policy interventions.

This study offered an analysis of the stories composed by primary and high school learners in response to the broad question, 'What were your experiences of learning under lockdown?'

"We know from research that online learning in unequal social contexts leads to unequal academic outcomes," Jansen says. "What we do not know is how students in unequal societies experience lockdown learning through various forms of online learning – if at all."

**The social context of learning in homes cannot be assumed to be uniform, let alone uniformly supportive of student learning.**

In May 2020, Jansen posted on social media (Facebook and Twitter) an invitation to school learners to write a short essay on their experiences of learning under lockdown. The research effort came to be known as the 'LuL Project'.

Students from at least 220 schools from all 9 provinces submitted stories. The majority of submissions came from high schools (84%). Some stories were sent via teachers. Others were written on paper and copied via a WhatsApp message or sent as an email attachment. Each story came with the child's age, name (some chose anonymity), school and province. Given the nature of the call via social media, the stories submitted are not, therefore, representative of the national school system.

## Lessons for policymakers

There are, however, many lessons from this study for immediate and urgent education policy actions. Firstly, there must be educational mitigations for the predictable growth in inequalities between students in the three categories of learning experiences described as the 'Google classroom group', the 'WhatsApp group' and the 'radio-and-television group'. One way to do this

is to develop a school-based version of what was developed for universities as strategies for addressing unequal technological access<sup>26</sup>.

Secondly, there must be provincial (Department of Education) guidelines for schools on how to manage student workloads via online learning through much better coordination at the school level. The piling on of workloads is a source of stress for students learning under lockdown.

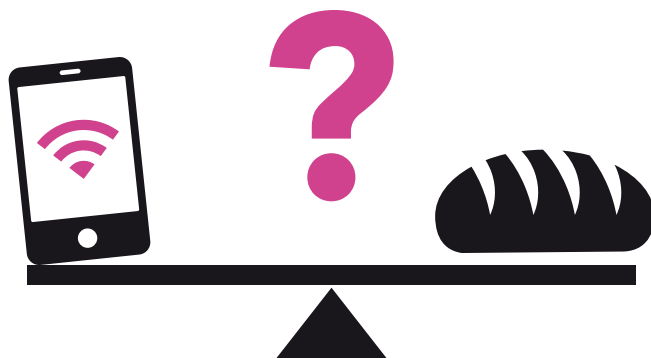
Thirdly, there must be structured emotional support for students both at home and as they return to school in the phased reopening approach. Such support could come from the resources of the more well-endowed schools or, in the case of the majority of public schools, government departments. As shown, the emotional vulnerability of students is directly related to their ability to learn.

Jansen's fourth lesson is that urgent investment is needed in teacher capability and technological capacity that lead to highly interactive, substantive and resource-rich pedagogies rather than the simple 'dumping' of content to learn for examination purposes.

Furthermore, online learning calls for design elements that encourage social learning, given the relative isolation of students. This need for human connection is something strongly expressed in students' stories. Research has also revealed such a need among teachers.

Schools should provide students with concrete guidelines for managing their own learning in the context of home dwellings that impede learning in different ways. Students could also be given direction on how to manage distractions and pace their learning in the absence of a physical teacher. Parents need to be informed on how to create dedicated time and spaces for learning, even in home dwellings where this is difficult (such as crowded homes). The social context of learning in homes cannot be assumed to be uniform, let alone uniformly supportive of student learning.

The government must plan for investments in infrastructure that serves poor and working-class schools to ensure the availability of data and devices for learning, Jansen concludes.



# THE NEOLIBERAL IMPACT ON SOCIAL WORK AND WHY IT MATTERS

**WHILE SOCIAL WELFARE POLICY FORMS A CORNERSTONE OF THE SOCIAL WORK PROFESSION, ECONOMIC POLICY OFTEN REMAINS DISTANT AND OF ACADEMIC INTEREST ONLY. THE IMPACT OF ECONOMIC POLICY ON THIS PROFESSION IS, HOWEVER, BECOMING EVER MORE APPARENT IN THE WAKE OF THE COVID-19 PANDEMIC, WHICH HAS AFFIRMED SOCIAL WORK AS AN ESSENTIAL SERVICE.**

This impact was the topic of a recent research project by Dr Abigail Ornellas (postdoctoral fellow) and Prof Lambert Engelbrecht, both from SU's Department of Social Work, and Evan Atamturk from Kocaeli University in Turkey. The team established that the global impact of neoliberal economics on the day-to-day practices of social workers is fourfold in terms of the marketisation, consumerisation, managerialisation and de-professionalism of social work.

## **The fourfold impact on social services**

Marketisation is the expectation that social services and NGOs should rely less on government support and funding, and function as private operations. It is resulting in an escalating outsourcing of social work services and the state distancing itself from its responsibility to deliver welfare and offer economic and structural support to NGO groups that are required to fill this vacuum. This is often introduced in grassroots interventions under the guise of social development and community participation.

The relationship between social worker and service user is becoming one of contractor and consumer in which individuals and communities are blamed for the challenges they are

facing under a structurally defective system. The consumerisation of social work constitutes a dominant welfare discourse that promotes the self-reliance of individuals, families and communities to take responsibility for their own wellbeing. It promotes individual and individualistic interventions over and above addressing macro and structural needs through a collective approach.

Proponents of the managerialisation of social work believe services in the public or voluntary sectors should be modelled on management knowledge by employing cost-efficiency and cost-effectiveness as yardsticks, and are preoccupied with procedures, norms and standards. Such managerialisation has reduced social work intervention to the ticking of boxes and the evaluation of the cost-effectiveness and efficiency of activities performed, rather than the assessment of the human impact.

With the standardisation of social work activities under the guise of evidence-based work and best practice, social work is becoming deskilled, devalued and de-professionalised. The de-professionalisation of social services involves reducing professional discretion, deskilling social workers and diminishing their professional autonomy and identity.

The profession has, throughout history, been influenced by political and

economic priorities. Understanding this, social workers should be keenly aware of global realities and forces. The researchers warn that the impact of neoliberalism on the social work profession could be absolute and hidden if it is not monitored more closely, especially during the COVID-19 pandemic and beyond when the focus of governments will be on normalising societies again.

## **Becoming aware**

It is imperative to note, they emphasise, that a critical analysis of the neoliberal impact on social work is not an undermining or critiquing of the essential, valuable work that the social work profession continues to do globally from one day to the next – the valuable role that has become even more apparent during this time of the pandemic.

Rather, the contention is that this critique re-emphasises the intrinsic value of social work and the potential of a redistributive and truly remarkable profession that should not be undermined or swayed by political ideologies and economic forces that do not serve, in a humane way, the communities that social work professes to protect.

The researchers urge the social work profession (and the broader public) to become aware of often hidden neoliberal impacts so that it can stand its ground in an increasingly volatile neoliberal world.

In the wake of the COVID-19 crisis and beyond, the devastating impacts of an individualised, cost-effective and business-driven social work profession are impossible to ignore. Civil society and professional social workers need to critically reflect on how they may, unknowingly, be promoting a neoliberal discourse and economy-centric values, and recognise the direct contradictions this holds for the mandate of the social work profession.



# COVID-19 AND PROBLEMATIC USAGE OF THE INTERNET

**WORLDWIDE, THE OUTBREAK OF COVID-19 HAS LED TO PRECAUTIONARY STEPS TO REDUCE THE RISK OF INFECTION, INCLUDING 'LOCKDOWNS'. PROFOUND LIFESTYLE CHANGES HAVE COMPELLED HUMANKIND TO BE EVEN MORE RELIANT ON THE INTERNET THAN BEFORE.**

The internet facilitates and improves everyday life and activities, but also carries the risk of excessive or aberrant use. Indeed, internet use does not become problematic only when it takes up too much time or replaces normal interaction, but also when the nature of the activity causes distress or impairment, e.g. financial and relationship difficulties associated with uncontrollable gambling, shopping or online pornography watching.

Many of these behaviours develop into habits that are difficult to break, and can be referred to as constituting 'problematic usage of the internet' (PUI). Similar to other putative behavioural addictions, PUI is typically characterised by excessive use of the internet, social withdrawal, tolerance (the need to use the internet for ever-increasing amounts of time) and negative repercussions.

The aim of a study conducted in the South African Medical Research Council (SAMRC) Unit on Risk and Resilience in Mental Disorders in SU's Department of Psychiatry was to examine the impact of the COVID-19 pandemic on PUI in South Africa, one of the worst-affected countries in Africa. The researchers involved in this project included Prof Christine Lochner, Prof Dan Stein, Clara Marincowitz, Charlene Omrawo and Gizela van den Berg. Data for this study were collected until October 2020. The

analysis includes investigation of cross-sectional data collected at five different time points, reflecting the different stages of lockdown in South Africa (Level 5 to Level 1).

Data analyses suggest that higher levels of stress among adults due to the COVID-19 pandemic are associated with greater maladaptive usage of the internet. Other influencers of PUI include impulsive symptoms, compulsive

traits and younger age. Arguably, the longer-term impact of these constructs may take months or years to become fully apparent. Managing the impact of COVID-19-related stress, as well as that of the other relevant constructs, on PUI will require a concerted effort. If left unmanaged, the effects of PUI may linger far longer than those of the pandemic itself.





# USING TECHNOLOGY TO PROVIDE PSYCHOLOGICAL SUPPORT DURING THE PANDEMIC

**TECHNOLOGICAL INNOVATIONS ARE RAPIDLY SHAPING THE DELIVERY OF MENTAL HEALTHCARE AND ARE HELPING TO CLOSE THE TREATMENT GAP BY IMPROVING PEOPLE'S ACCESS TO AFFORDABLE AND EFFECTIVE INTERVENTIONS.**

The potential to use technology to deliver psychological services remotely came into sharp focus during the early stages of the COVID-19 pandemic when the need for social distancing and the imposition of lockdowns prevented many people from accessing routine face-to-face support.

While technology has created new possibilities for delivering psychological interventions, many of these novel technologies have not been rigorously tested in well-designed clinical trials. Indeed, developers are not even sure yet whether digital interventions are appealing and acceptable to people in distress. This is the context in which Prof Jason Bantjes (of the Institute for Life Course Health Research in SU's Department of Global Health) and his team set out to investigate whether online group therapy using videoconferencing platforms could, amidst a pandemic, be an effective and acceptable way to help university students overcome depression and anxiety.

## **Online group therapy for students**

One of the most effective treatments for depression and anxiety disorders is cognitive behavioural therapy (CBT), which is a short-term structured treatment that helps people to identify and change unhelpful patterns of thinking

and acting. This mode of therapy has been well researched, and studies have shown that it can be very effective as both individual therapy and group therapy. However, it is hard to find good research that shows that CBT can also be delivered remotely via online groups.

Working with colleagues at Harvard University (USA), Bantjes and his team developed a brief ten-week group therapy programme that aimed to reduce symptoms of depression and anxiety among university students. The psycho-educational content was developed in consultation with students and was designed to be relevant to the kinds of problems young adults typically experience. The groups (12 in the initial phase) met once a week for 60 to 90 minutes and were facilitated by counsellors from SU's student counselling services and SU clinical psychology master's students. A total of 175 students participated in the first round of group therapy, which commenced during April and May 2020, at the start of lockdown in South Africa.

## **Significantly positive results**

The results<sup>27</sup>, published in the *Journal of Medical Internet Research*, were very surprising. The research team observed significant reductions in symptoms of depression and anxiety in most students who attended the groups regularly.

The prevalence of major depressive disorder fell from 49,6% at the start of the programme to just 18,4% at the end, while the prevalence of generalised anxiety disorder fell from 45,6% to 16,9%. These are statistically significant changes that are completely in line with the most effective face-to-face treatments available. What was most surprising was the very high attendance rates and the low dropout rates, which are not typical for group interventions, particularly group interventions for university students.

Even more remarkable than the reduction in symptoms was the feedback the team received about the acceptability of online groups as a medium to offer mental health support to students. A total of 90,3% of participants reported overall satisfaction with the intervention, 95,2% said they were likely to recommend it to a friend, and 88,7% reported that the intervention helped them deal more effectively with their problems.

But the structure of the groups and the psycho-educational focus did not appeal to everyone. Some participants reportedly wished for more time and space to engage more informally with other students.

While the group sessions did not work for everyone, the programme showed that group therapy can be very effective at reducing depression and anxiety for a significant number of students, even when the groups meet in cyberspace. The next step will be to see whether the team can get better at predicting which students will respond well to this form of intervention so that they can make appropriate treatment decisions and direct students to the best form of support for them.

This work was funded by the South African Medical Research Council (through its Mid-Career Scientist Programme) and by SU (through the Deputy Vice-Chancellor: Research, Innovation and Postgraduate Studies). The project is integral to a collaboration between SU's Institute for Life Course Health Research and Centre for Student Counselling and Development, Harvard Medical School's Department of Health Care Policy and the WHO World Mental Health International College Student (WMH-ICS) Initiative. This collaboration is aimed at identifying novel ways to promote student health.

The team is working with colleagues in Romania, China, the USA and Pakistan to expand their research to other universities internationally. They are also collaborating with other local universities to seek funding for expanding the intervention across campuses in South Africa. The team will also begin to test other forms of digital mental health interventions, such as mobile apps and web-based therapy.

### Tracking suicide rates

Bantjes is also a part of the International COVID-19 Suicide Prevention Research Collaboration (ICSPRC)<sup>28</sup>, an international network of suicide prevention experts working together to understand the impact of the pandemic on suicide rates globally. An ICSPRC study<sup>29</sup> on suicide trends in the early months of the pandemic was published in *The Lancet Psychiatry* journal.

This study saw roughly 70 authors from 30 countries working together to compare the numbers of suicides in 21 countries between 1 April and 31 July 2020 to trends in the previous one to four years.

"The best available data suggest that suicide rates in high-income and upper-middle-income countries have remained largely unchanged and have even declined in some instances. Of course, this does not mean that people are not in psychological distress as a result of

COVID-19, but it does highlight the reality that there is not a simple linear relationship between psychological distress and suicide. Psychological distress is only one factor in a complex network of factors that lead to suicide," Bantjes explains.

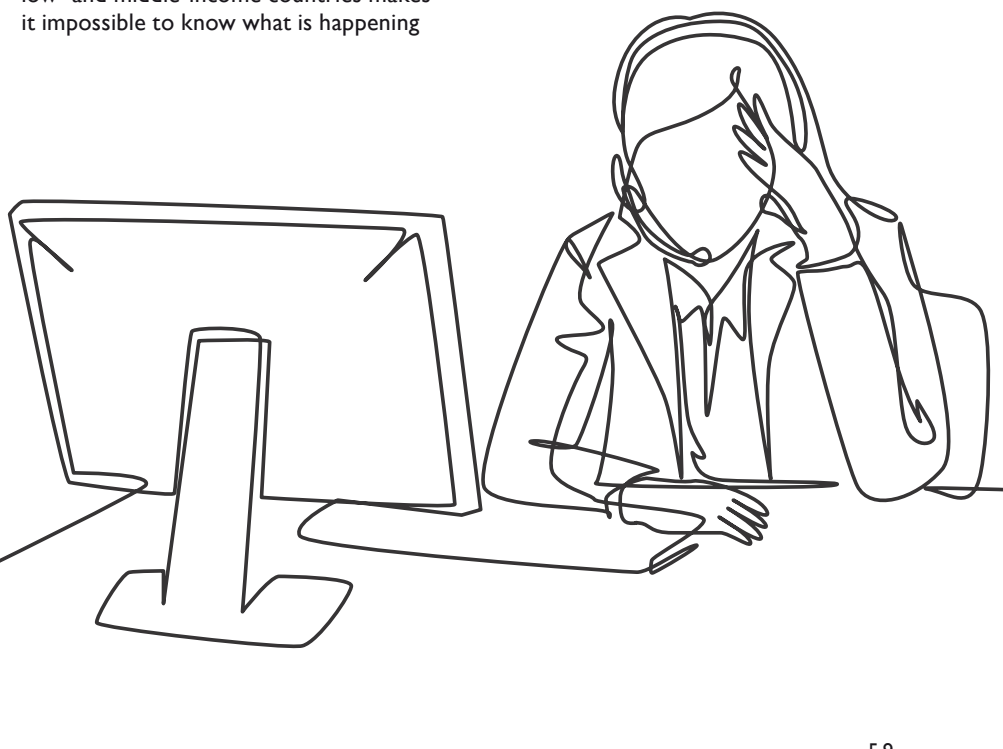
According to the authors, their findings could be explained by some of the steps taken by governments in certain countries, such as increasing or adapting mental health services to mitigate the potential impact of lockdown measures on mental health, and putting fiscal measures in place to help compensate for the financial impact of business closures and job losses.

Another possibility identified by the authors is that the pandemic has promoted certain factors that are known to protect against suicide – including strengthened family ties due to increased time at home, communities' support of their most vulnerable members, and novel ways of connecting with others online. A collective positive feeling of 'being in it together' may also have contributed.

The study, unfortunately, did not include low- or lower-middle-income countries, those likely to be hardest hit by the effects of the pandemic. "The lack of reliable current suicide data from low- and middle-income countries makes it impossible to know what is happening

in many parts of the world. It is too soon to know what impact the pandemic has had on suicide rates in South Africa, but we should not assume suicide rates will necessarily increase until we have seen and properly analysed the data. We need to continue to monitor suicide statistics in South Africa so that we can make informed evidence-based decisions about how to respond," says Bantjes.

"Suicide can be prevented, and help is available. People who are feeling suicidal should seek professional help, reach out to their social support systems and make use of crises services such as those offered by Lifeline and the South African Depression and Anxiety Group (SADAG)," Bantjes emphasises.



# PROPERTY AND PANDEMICS: A PROPERTY LAW PERSPECTIVE

**THE INSTRUCTION CENTRAL TO THE GLOBAL RESPONSE TO COVID-19 WAS TO “SHELTER IN PLACE”. THIS INSTRUCTION TOOK FOR GRANTED, FIRSTLY, THAT PEOPLE HAD A PLACE TO SHELTER AND, SECONDLY, THAT THIS SHELTER WAS SAFE AND OF AN ADEQUATE STANDARD TO STAY IN FOR AN EXTENDED PERIOD WITH OTHER OCCUPANTS.**

This is not true of the living conditions of a large part of the South African population, and it was this issue that first drew the attention of the South African Research Chair in Property Law (SARCPL) at SU’s Faculty of Law.

Through engagement with property law scholars from across the globe, it became evident that the impact of the pandemic on property law would be much more extensive than first anticipated. The SARCPL, therefore, created a project to steer research on a list of different topics. Among these are the treatment of the homeless during and after the national lockdown; the position of tenants unable to meet rental obligations and that of mortgage holders unable to meet mortgage obligations; and the effect of the moratorium on evictions on all affected parties.

Other topics include the impact of the pandemic on the property rights of rural residents and women, as well as on spatial planning; whether the pandemic will fundamentally affect how we understand, reform or protect existing property rights; and an evaluation of the systemic response of the property law system specifically, and the legal system more widely, to the pandemic.

The project was first conceptualised by Dr Elsabé van der Sijde (a fellow and researcher of the SARCPL), under the leadership of Prof Zsa-Zsa Boggenpoel (Chair of the SARCPL). It is steered by these two researchers, with the help of a SARCPL postdoctoral fellow, Dr Mpho Tlale, and current SARCPL doctoral candidate, Sameera Mahomed.

Research findings pertaining to the 11 identified topics will be published by Juta as an edited collection of 18 contributions from 3 jurisdictions, during the course of 2021. At the time of writing, peer review had been completed and the manuscripts were being prepared for publication.

The SARCPL was also asked to contribute to an international discussion on the effects of the pandemic on property law, especially planning law. Boggenpoel participated in this discussion,

which was released as a Youtube *video*<sup>30</sup> in 2020. Other research endeavours will include contributions to popular media discussions, commentary on proposed policy and legislation, and the publication of a research report with a summary of research findings in February 2022.

**Through engagement with property law scholars from across the globe, it became evident that the impact of the pandemic on property law would be much more extensive than first anticipated.**





# STUDY CONSIDERS THE ROLE OF NURSES DURING COVID-19

**INNOVATIVE SOLUTIONS ARE NEEDED FOR THE CONTINUATION OF PREVENTATIVE AND OTHER PRIMARY CARE SERVICES DURING A PANDEMIC. SIMULTANEOUSLY, INFECTION PREVENTION AND CONTROL, AND PANDEMIC PREPAREDNESS NEED TO BE EMPHASISED IN NURSING CURRICULA. THESE WERE AMONG THE CONCLUSIONS REACHED IN A RECENT WESTERN CAPE COVID-19 PRIMARY CARE STUDY.**

It also appears that there is a need for greater workplace support as far as nurses' mental health is concerned, according to Dr Talitha Crowley, a senior lecturer in SU's Department of Nursing and Midwifery.

The data for the primary care study were collected between 3 July and 1 September 2020 – when COVID-19 was at its first peak in the Western Cape – on the initiative of the above-mentioned department and in collaboration with the Department of Global Health. The study entailed conducting an online survey among SU postgraduate diploma students in primary care and alumni from the 2017 and 2019 year groups who were working in primary care facilities at the time of the study.

As the first point of entry into the healthcare system for many patients, primary care nurses play a pivotal role in curbing the spread of infectious diseases, Crowley emphasises.

The South African health system is already heavily burdened with various preventative and curative services, including chronic care. The reality is that essential primary care services have to continue despite the additional workload brought about by the COVID-19 pandemic. At the same time, nurses have to manage their own risk of contracting the virus.

Nearly 60% of the 83 participants in the study mentioned that COVID-19 affected other services, such as women's and children's health services and chronic

care, with more than 45% reporting that service quality in primary care facilities was worse than before. Most facilities were forced to reorganise health services due to COVID-19 by, for example, halting some outreach activities and teaming up with NGOs for the home delivery of chronic medication.

There was general concern about patients with HIV or tuberculosis (TB) and those in need of chronic care. Some nurses were also concerned about the long-term impact of the unavailability of services for baby wellness and sexual reproductive health during COVID-19.

In terms of COVID-19 training, between 44% and 58% of the respondents felt they were adequately prepared to provide the necessary care. This was in line with the findings of a similar, UK study. Yet, 12% of respondents received no training. The most common method of training used was an instructional video. Participants indicated a need for formal training and training on specific topics, such as the difference between how adults and children present with symptoms of COVID-19.

Among the challenges experienced by participants was dishonesty about symptoms. Due to fear of being denied

help, some patients disclosed their COVID-19 symptoms only when in consultation at a primary care health facility.

A large percentage of nurses had access to guidelines on how to triage and manage COVID-19 patients, although the relevant facility's infrastructure was not always taken into account. Challenges with infrastructure were experienced, especially in the smaller and mobile clinics. In future, guidelines may need to be adapted to the relevant phase of the pandemic.

Almost 60% of the respondents indicated that the correct personal protective equipment was always available. However, a lack of personal protective equipment was often experienced. In some instances, this led to the theft of items, which necessitated the locking away of equipment.

The greatest need in terms of working conditions was stress management support. Although 42% of respondents experienced COVID-19-related stress frequently or very frequently, only 15% indicated that they had mental health support in the workplace. About 61% had to self-isolate at some stage. More than a fifth (21%) of respondents had fewer opportunities than usual to rest.

The lessons learned from this study highlight gaps in the primary care health services that are crucial to preparing primary care facilities for the implementation of the planned National Health Insurance system, Crowley says. Strategies implemented during the pandemic need to be studied, including collaboration between the private sector, NGOs and public health clinics, and the use of testing centres. However, more research, especially that of a qualitative nature, is needed.

**Primary care nurses play a pivotal role in curbing the spread of infectious diseases as the first reason for entry into the healthcare system for many patients.**

# SA FACES OBSTACLES TO BEHAVIOURAL CHANGE AMIDST PANDEMIC

**IN MID-2020, THE COVID-19 INFECTION RATE ACCELERATED AT AN ALARMING PACE IN SOUTH AFRICA. THERE WAS GREAT UNCERTAINTY ABOUT THE IMPACT THAT THE PANDEMIC AND LOCKDOWN WOULD HAVE ON SOUTH AFRICAN SOCIETY. A RESEARCH ARTICLE<sup>31</sup> PUBLISHED IN GLOBAL PUBLIC HEALTH AT THE TIME, AUTHORED BY DR BRONWYNÉ COETZEE AND PROF ASHRAF KAGEE FROM SU'S DEPARTMENT OF PSYCHOLOGY, WARNED THAT ENSURING ADHERENCE TO LOCKDOWN RULES IN CONDITIONS WHERE CITIZENS LIVE WITHOUT SECURE AND PAID WORK WOULD BE DIFFICULT IF THE COUNTRY'S PARTICULAR STRUCTURAL BARRIERS TO BEHAVIOURAL CHANGE WERE NOT ADDRESSED.**

“In South Africa, unlike in the United States where the infection rate is climbing at an exponential rate due to political and ideological reasons, we are facing specific structural barriers that are particular to this country and will hinder individual behavioural change,” Kagee explained.

“As we know, in low- and middle-income countries, many of which have large proportions of the population living in precarity, lockdown forces millions of people to spend prolonged periods of time together in close proximity to one another and with limited resources. In many ways, efforts to contain the spread of COVID-19 in densely populated communities with limited access to food, water and sanitation may seem counterintuitive and be quite difficult under conditions of precarity,” Coetzee and Kagee wrote.

These circumstances, the researchers explained, highlight the fact that while COVID-19 may not discriminate against anyone in terms of vulnerability to infection, it deepens discrimination based on socio-economic status.

“Isolation assumes that everyone has access to personal space and has the ability to continue with paid work

from home. In many low- and middle-income countries like South Africa, work is often of a physical nature and cannot be done remotely, unlike in the case of many white-collar jobs that have been integrated into the digital economy. Thus, jobs in the informal sector such as street vending, minibus-taxi driving, artisanship, domestic helping, and casual work in small businesses, which are common in South Africa, are likely to be lost. To this extent, COVID-19 does indeed discriminate on grounds of socio-economic status as it exacerbates social inequality that occurs as a consequence of lockdown,” Coetzee and Kagee explained.

Like many other experts, these researchers advised that managing the crisis in this country would require a multidisciplinary team of experts such as policymakers, economists, psychologists and medical professionals to work together to find realistic solutions that are specific to South Africa's challenges. They added that there is also a unique role for psychologists and mental health specialists to play to ensure behavioural change and adherence to regulations.

Coetzee and Kagee were cognisant of the fact that “behavioural change is difficult and complex” even under the

best of circumstances. However, by utilising a behaviour change theory known as the ‘Theoretical Domains Framework’, they identified possible solutions to local challenges.

Writing during the SA Level 5 lockdown, they stated, “COVID-19-related information and messaging from the government should entail placing emphasis on the responsibilities of citizens to take care of their health and that of their compatriots, rather than on the punitive consequences associated with the violation of lockdown conditions. Relatedly, the rationale for lockdown rules needs to be communicated transparently to citizens by governments. To ensure adherence, it is important for the government to take its citizens into its confidence and share the information on which they base their decisions.”

Kagee and Coetzee also advised that “authoritarian and military approaches to ensuring adherence should be kept to a minimum”.

The researchers furthermore argued in their paper that internet access should be made widely available by making data as affordable as possible, or even free, to ensure the free flow of information to all citizens.

They suggested countering fake news and misinformation to minimise panic and incorrect health practices. They also proposed scaling up access to e-banking to allow more citizens to receive welfare relief in countries where national budgets permit this.

Now, a year since the article first appeared in the academic literature, the circumstances surrounding the COVID-19 pandemic have changed. However, social distancing, mask-wearing and hand-washing remain as important now as it did then. Equally important is the need to counter vaccine hesitancy so that uptake is high. “The COVID-19 pandemic is a long way from being over. To some extent, people have become habituated to living with the pandemic, but we dare not let our guard down”, Coetzee and Kagee emphasised.

# COVID-19'S IMPACT ON MENTAL HEALTH

THE SEVERE ACUTE RESPIRATORY SYNDROME CORONAVIRUS 2 (SARS-COV-2)

OUTBREAK CONTINUES TO RAVAGE POPULATIONS AROUND THE WORLD.

Currently available global sex-disaggregated data indicate that more men than women are dying from COVID-19, ascribed in part to disproportionately higher rates of hypertension and cardiovascular and respiratory disease in men. However, it is as yet unclear whether gender differences affect infection rates and vulnerability to the disease.

The physical and mental health impacts of the disease, as well as its social and economic impacts, have been inordinately borne by poor South Africans who make up 50% of the country's population.

Studies showed that 30 months after the SARS outbreak in 2003 (the first massive infectious disease outbreak of the 21st century), a third of survivors met the criteria for any psychiatric disorder, a quarter met the criteria for posttraumatic stress disorder (PTSD), and approximately 16% had depressive disorders.

The pattern is not dissimilar during this pandemic, according to Prof Soraya Seedat, DSI-NRF SARCHI Chair in Posttraumatic Stress Disorder. Recent evidence points to ongoing psychiatric and neurological problems as part of 'long COVID' (or 'post-acute COVID-19 syndrome'), with one-third of individuals diagnosed with COVID-19 developing a psychiatric or neurological problem within six months of their diagnosis. Rates of psychiatric and neurological problems are even higher among those who experienced severe illness that required hospitalisation.

This points to the importance of the early detection and treatment of psychiatric and neurological problems in individuals with COVID-19. In addition to individuals with COVID-19 being at an increased risk of psychiatric sequelae, the presence of pre-existing psychiatric conditions is also an independent risk factor for contracting COVID-19.

The pandemic and lockdowns that have impacted on billions of people have had, independently and in combination, unintended consequences of severing family and social ties, and suppressing the practising of certain values and rituals. This has, no doubt, exerted a severe toll on the mental health of the world's population that will be palpable for many years to come.

The social isolation and stress linked to the COVID-19 crisis have not only increased the risk of new episodes of mental illness but also the risk of recurrence in persons with pre-existing mental illness, Seedat says.

Previous quarantines have consistently been found to have long-term after-effects such as PTSD, depression, alcohol abuse and dependence, and poorer mental health, with PTSD being specifically associated with longer durations of quarantine.

Common stressors during quarantines include longer periods of quarantine, fears of being infected, frustration, boredom, shortage of supplies, inadequate information from public health authorities, financial loss and stigma.

## Economic distress

The economic repercussions of COVID-19 in South Africa have been dire, despite government-led packages of interventions intended to mitigate the impact.

Seedat says, "Research on the mental health consequences of economic crises has taught us that there is a significant relationship between severe economic recession and population-level psychological distress, including the emergence, and worsening, of mood, anxiety and substance-related disorders and suicidal behaviour."

Risk factors for suicidal behaviour include social isolation, financial worries, heightened anxiety and guilt about

exposing others to the virus or not doing enough to help others.

In the same way, past economic crises around the world resulted in greater demands for general medical care, greater use of prescription drugs and an increase in hospital admissions due to mental illness. As has been seen around the world, COVID-19 has resulted in anxiety, depression and PTSD. Post-pandemic PTSD is of particular concern, with healthcare workers being at the highest risk, followed by persons who contract COVID-19.

The characteristic features of PTSD are hypervigilance associated with one's health, which could be coupled with marked anxiety about safeguards and protective measures to avoid infection; intrusive thoughts about being infected, one's health and fears of dying; avoidance and withdrawal; and negative mood and thoughts. All these symptoms can be subjectively distressing and have a marked impact on day-to-day functioning.

## Intergenerational trauma

In the face of the lockdown restrictions and accompanying economic hardship, South African youth and persons with pre-existing mental illness have, according to Seedat, been especially hard hit by the potentially severe and long-term mental health consequences of COVID-19.

This pandemic, like other pandemics, shares features of unpredictability, widespread community impact, mass fatalities and both evolving and persistent effects.

The stress, fear and emotional pain induced by the rapid and aggressive spread of infection, coupled with the scale of prolonged grief linked to the sudden and massive loss of life, will be felt for years to come, not only by current generations but by successive generations.

Exposure to prolonged and unpredictable stressful life events in children and adolescents is associated with disrupted neurodevelopment; social, emotional, and cognitive impairments; medical and psychiatric disorders; disability; and even premature death in adulthood. (In South Africa, children and adolescents make up a third of the population).

Excessive and prolonged stress can induce changes in our genes by altering their expression, and these changes can be passed on to future generations, with wide-ranging and damaging health effects. In other words, the enduring stress of the current COVID-19 pandemic may result in the continuation of vulnerability to adversity and disadvantage via genetic changes, passed on by parents to a future generation.

### **Mental health impact on groups at risk**

From a public mental health perspective, it is critical to identify and address the short- and long-term mental health impacts of COVID-19, especially since mental health is fundamentally intertwined with physical health. Particular attention must be paid to at-risk groups which include, but are not limited to, healthcare workers, women, youth, the elderly and the mentally ill. Other groups such as refugees, migrants and people living with disabilities are equally important and should not be forgotten.

### **Healthcare workers**

South African healthcare workers managing patients with COVID-19 have faced many of the challenges experienced by healthcare workers in other parts of the world. This includes coping with the scale of disease and death, shortages of staff and essential resources, grief and moral distress associated with the rationing of ventilators.

Against the backdrop of high infection risks and inadequate infection protection, studies on the mental health impact of COVID-19 in healthcare workers have found that these workers have been faced with enormous work pressures, excessive workloads, exhaustion, frustration, discrimination, isolation, and lack of contact with their families. These pressures were associated with symptoms of stress, anxiety, depression, insomnia, denial, anger and fear – negatively impacting their work ability and decision-making capacity.

In addition to the fact that they work in unsafe, under-resourced and morally distressing situations, healthcare workers' emotional distress is further exacerbated

by concerns about medical outcomes in the short and longer term, and by uncertainty. In the face of fast-changing clinical management and public health guidelines, this includes uncertainty about the trajectory of the pandemic and a looming third wave of infection.

Accumulated evidence from studies of medical personnel conducted during the pandemic reveals high rates of adverse mental health outcomes, including fear-related symptoms, high levels of perceived stress, symptoms of anxiety and insomnia, depressive and somatic (physical) symptoms, and previously mentioned PTSD.

As such, addressing work and health concerns, proactively monitoring healthcare workers' well-being and instituting measures to foster resilience are key to delivering high-quality safe and effective care. This requires ongoing and concerted efforts on the part of hospital management and clinical leaders, Seedat highlights.

### **Impact on women**

During the lockdown, many women have disproportionately borne the burden of childcare, home schooling and domestic chores. They have also been vulnerable to intimate partner violence, which has seen a rise during the COVID-19 pandemic.

For women with pre-existing psychiatric disorders, the stress and unpredictability of the situation, and the ongoing risk that COVID-19 poses to themselves and their families, can trigger a relapse of anxiety and depression. It is also important to bear in mind that mood and anxiety disorders are at least twice as prevalent among women as among men.

Infection-related fears have impacted on women's access to health services, including obstetric care and sexual and reproductive services, further adding to their psychological stress and distress.

### **Spotlight on children**

Although relatively fewer children and adolescents have been infected with SARS-CoV-2 compared to the general population, children can be vectors of transmission and, as such, play a role in the spread of SARS-CoV-2 in families and communities. The physical, social and mental health needs of children and their families must be factored into all

measures implemented to mitigate the long-term effects of this trauma.

In a study of mental health related to the SARS pandemic in 2003 and the swine flu pandemic in 2009, 30% of isolated or quarantined children and 25% of isolated or quarantined parents showed clinically relevant symptoms of PTSD. Moreover, posttraumatic stress scores, indicating symptom severity, were four times higher in children who had been quarantined compared to those who had not been quarantined.

Family conflict during the pandemic may be intensified as parents need to juggle working from home with caring for children. Consequently, children and adolescents over this time may experience fear and sadness and should be given the freedom to communicate their distress in a safe and supportive environment. Depression and anxiety in children and adolescents have emerged as a common mental health difficulty, in addition to increasing behavioural difficulties and somatic symptoms.

Particularly worrying are reports of increased abuse of and violence towards children in the home, and increased exposure to online abuse. During the Ebola outbreak in West Africa from 2014 to 2016, school closures contributed to spikes in child neglect, sexual abuse and teenage pregnancies.

Seedat says, "It is important that parents identify and monitor children's emotions, validate these emotions, provide reassurance, regularly connect with their children, re-establish routines as a family, and limit media exposure relating to COVID-19. Physical school attendance is also vital for mental health, that is school attendance and school connectedness are indeed protective against a number of poor mental and physical health outcomes."

### **The elderly**

In South Africa, approximately 10% of the population is 60 years or older. This age group has a heightened susceptibility to COVID-19 infection and high mortality rate once infected, highlighting the urgency of vaccinating this group. The rapid transmission of SARS-CoV-2 and the high death rate could exacerbate



the risk of mental health problems and worsen existing psychiatric symptoms among the elderly, further impairing daily functioning and cognition in this group. Given that quarantine and public transport restrictions have affected access to health services, with older South Africans being more marginalised, there are concerns about the access of the elderly to vaccinations during the roll-out.

These challenges may be even greater in the face of pre-existing psychiatric conditions, such as dementia, Seedat says. Elderly people with dementia may, because of memory loss, experience difficulties in remembering personal protective procedures, such as hand and respiratory hygiene, and understanding public health warnings, which could expose them to a higher risk of infection.

In addition, people in old age homes are often highly dependent on support from carers to maintain their daily routines, stay active and receive meals. Diminished support, coupled with the lack of visitation by and face-to-face contact with family members may increase fear, anxiety and mistrust.

Patients with a mental illness who display disorganised behaviour, are impulsive, practice suboptimal self-care and have impaired insight may not be in a position to exercise preventative measures and protect themselves in the face of COVID-19. Added risks for patients with serious mental illness (e.g., schizophrenia and bipolar disorder) during a pandemic that has been as prolonged as this one include social isolation, loneliness, homelessness and poor physical health.

Because physical illness such as hypertension, diabetes and cardiovascular disease is more than twice as prevalent among individuals with mental illness as among members of the general population, patients with mental illness have a heightened vulnerability to developing COVID-19 pneumonia and other complications.

Furthermore, the high co-occurrence of being overweight or obese, lack of exercise and other unhealthy lifestyle factors, and the side effects of psychotropic medication among individuals with psychiatric illness must not be underestimated.

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**With the easing of lockdown conditions, it became evident that neither increased compassion and charity nor guilt-driven changes in political awareness and acceptance of historical responsibility, are likely to be sustained.**

### **The way forward**

Given the impact of COVID-19 on mental health, a comprehensive set of multisectoral interventions targeting mental health, well-being and resilience is needed for the general population and vulnerable groups during the period of vaccination roll-out.

“We can continue to learn from the successes and challenges of other countries,” Seedat says. “As this is still a little-known virus with variants that are rapidly emerging, it is prudent that we overestimate rather than underestimate the longer-term mental health consequences of the disease and the resources that are required.”

Studies relating to the mental health impacts of COVID-19 are being conducted by researchers in SU’s Department of Psychiatry.

Firstly, the researchers are involved in the ‘Collaborative Outcomes on Health and Functioning during Infection Times’ (or COH-FIT) study. This study tracks both mental health and physical health outcomes of COVID-19 in the general population. To date (June 2021), more than 150 000 people from 155 countries have participated, with more than 2 600 participants being South African.

Secondly, the researchers also participated in a study called ‘COMET’ (the COVID-19 International Survey on Mental Health). This recently completed study, led by Vrije Universiteit Amsterdam, examined the longitudinal course of mental health in the general population to identify stressors that contribute to mental illness – depression, anxiety, PTSD, domestic violence, financial impacts, substance abuse and self-identified stressors. The study assessed the mental health of more than 7 700 people, including 525 South Africans.

Preliminary trends show that South Africans experienced a much greater

reduction in income without financial assistance from the government.

The baseline assessment between May and June 2020 showed that South Africans have significantly higher levels of depression, anxiety and PTSD compared to people in 13 other countries. These results are supported by findings from the Mental Health Million project, undertaken by Sapien Labs, that assessed mental well-being during the COVID-19 pandemic across eight English-speaking countries (including South Africa). In this investigation, researchers found that respondents from South Africa and the UK had the poorest well-being, with South Africans also reporting the greatest health and financial impacts from COVID-19 compared to other countries.

Thirdly, the ‘COVID-19: Supporting Parents, Adolescents and Children during Epidemics’ (or Co-SPACE) study, led by Oxford University, is examining how families are coping during the pandemic, using parent-child surveys. There are approximately 175 participants in South Africa. This study has been tracking the mental health of children and adolescents through the COVID-19 crisis. Researchers are seeking to identify what parental responses and actions protect children and adolescents from deteriorating mental health (over time, and at particular stress points), and how this may vary according to child and family characteristics.

Finally, researchers in the Department of Psychiatry have undertaken a pilot randomised controlled trial to test the effectiveness of a mobile app intervention to prevent COVID-19-related mental health sequelae in frontline clinicians. This study is nearing completion and will be followed by a large-scale randomised controlled trial that will include all cadres of healthcare workers.





# INCLUSIVITY IN A TIME OF CRISIS

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# COVID-19 AS AN OPPORTUNITY TO REIMAGINE BELONGING

**THE COVID-19 PANDEMIC SHOULD BE SEEN AS AN OPPORTUNITY TO REACH OUT TO VULNERABLE FOREIGNERS WHO TRY TO MAKE A LIVING IN SOUTH AFRICA, SAYS DR JUDY-ANN CILLIERS, A POSTDOCTORAL RESEARCHER IN THE DEPARTMENT OF PHILOSOPHY. HER DOCTORAL RESEARCH ON XENOPHOBIA AND POLITICAL NARRATIVES DRIVES THIS VIEW, EXPLORED IN MORE DETAIL BELOW.**

When President Cyril Ramaphosa announced the national state of disaster on 15 March 2020, many breathed a sigh of relief. We were witnessing a world being consumed by a new virus, with many world leaders failing to take sufficient action. “Our government’s early and decisive response communicated a desire to protect its people. Yet, even then, we knew that the cost of this strategy would be high, and that it would be paid primarily by those already marginalised in our society,” Cilliers says.

“Over the last year, we saw more and more instances of domestic and gender-based violence, more people losing their jobs as businesses close and, as the number of infections grew, more people without sufficient access to healthcare,” Cilliers continues. In a world that was already becoming increasingly hospitable to xenophobic nationalism before the pandemic, we started hearing and reading about increased attacks on foreigners across the globe, especially those of Asian descent. “Today, any outsider is a threat, a potential carrier,” she says.

## Perceptions as drivers of xenophobia

“While we often speak of the ‘unprecedented times’ we are living in, this kind of attack is not unprecedented,” Cilliers argues. “It is a common narrative in South Africa that foreigners should be kept out because they bring disease into the country.” All kinds of xenophobic discrimination, exclusion and violence against foreign nationals have been

justified by the claim that ‘they’ are the cause of physical diseases, such as HIV/Aids, and moral ‘diseases’, such as drug addiction and crime.

That this is true only in some cases is irrelevant to the xenophobe; humans easily extrapolate from ‘some’ or even ‘one’ to ‘all’. “The individual, collective and systemic causes of xenophobia, and its intersection with racism, sexism and other forms of oppression, are deeply complex,” Cilliers argues.

In studying instances of xenophobic discrimination and violence, Cilliers says, one thing becomes apparent: The xenophobe’s choice of victims is not determined by their guilt, actions, legal status or even their real nationality. It is enough that they exist here (wherever ‘here’ may be), and that the xenophobe perceives them as foreigners. She explains, “Xenophobia is thus not a response to a specific threat – despite our rationalisations about crime, job scarcity and viruses – but to a perceived threat, where the perception is shaped by the xenophobe’s own prejudices and stereotypes, and by our political narratives around belonging, borders, nationhood and membership. Such narratives shape our ideas about who has a right to belong or to exist here, and who does not.”

## Fear of the unknown

Cilliers says the fear underlying such perceptions may have different origins or motivations. According to Prof Loren Landau, a migration and development

expert at both Oxford University and Wits University, there is a deep apprehension in the South African context about the meaning of belonging. Anthropologist Frances Nyamnjoh, a professor at the University of Cape Town, locates this apprehension in a historically oppressed and excluded citizenry who, for the most part, still cannot meaningfully access the benefits and rights that come with membership.

“Xenophobia is a reaction to a sense of insecurity, of not having a place where one belongs, and a subsequent attempt to establish security,” Cilliers explains. As we face the fallout of the COVID-19 pandemic – rising unemployment, lower levels of food security, a weakened economy, and individual and collective trauma – the xenophobic violence that is already characteristic of contemporary South Africa may become more prevalent and entrenched.

The irony, according to Cilliers, is that the logic underlying such violence and such attempts to establish security and belonging precludes the possibility of establishing a more secure society. It is a logic that seeks to exclude and even destroy that which is strange or new, and it inevitably becomes self-consuming. If belonging is rigidly defined and policed, the circle of those who ‘truly belong’ will inevitably become smaller and smaller, she argues.





This logic stands opposed to what German-born American political theorist Hannah Arendt called ‘the fundamental human capacity of natality’ – our ability to begin something new. This ability is the root of our freedom, as we constantly bring new things into the world through our actions and interactions with others. “It is also necessarily unpredictable, which is why we often respond to it with fear and a desire to control. In asserting control, we banish the new and the strange and the unpredictable and, along with that, our own ability to act and exist freely,” Cilliers explains.

**Challenged to change, for the better**

Cilliers says the pandemic poses a challenge that, for most people, is radically new. “We have reason to be afraid in our current circumstances – to fear for our lives and livelihoods, to worry about the country and the world’s future. These fears have been closely tied

to our fear of others for so long, and the pandemic makes breaking these ties so much harder.”

It is much more difficult to conceptualise a form of belonging that is not exclusionary when we are isolated from one another and when the risks of sharing the world with others are so evident. We have seen examples of incredible selfishness and cruelty in this pandemic. Cilliers points out that, predictably, some of the regulations put in place to protect and support people in South Africa during this time – especially those that initially limited the activities of informal traders and workers – negatively affected foreigners in ways citizens were not affected.

Yet, she argues, the newness and strangeness of our situation offer us an opportunity to reassess our assumptions, to create new world-shaping narratives and to act in unpredictable ways. After hurricanes or earthquakes, great fires

or terrorist attacks, when people are on the edge of life and access to resources cannot be guaranteed, we do not see only dog-eat-dog competition but also altruism, solidarity and empathy, often between people who, under normal circumstances, would not have reached out to one other. Uncertainty can make us turn in on ourselves, but it can also open our eyes to realities and injustices we were blind to before.

“As we create meaning in this pandemic, as we analyse and live through the implications of the lockdown, and as we try to rebuild and, perhaps, build anew, we must not lose sight of the precarious position of foreign nationals in our society,” Cilliers concludes, “nor of the true danger to a society when it does not protect its most vulnerable members.”



# COVID DIARIES IS 'AN ARCHIVE OF WOMEN'S VOICES' AMID THE PANDEMIC

**TWO STELLENBOSCH UNIVERSITY (SU) ACADEMICS ARE THE DRIVING FORCES BEHIND A NEW BOOK CONTAINING A COLLECTION OF 35 CREATIVE ESSAYS THROUGH WHICH VARIOUS SOUTH AFRICAN WOMEN DESCRIBE HOW THE FIRST YEAR OF THE COVID-19 PANDEMIC IMPACTED THEIR WORK AND FAMILY LIVES, MENTAL WELLBEING AND COPING SKILLS.**

Contributions were received from researchers at Stellenbosch University and other South African institutions, and women who work in the corporate and NGO sectors. The essays reflect on how their once "normal" lived experiences have since dramatically changed, sometimes even bizarrely, and how women have had to cope with different layers of loss and care.

For co-editors Prof Amanda Gouws, SARCHI Chair in Gender Politics in the SU Department of Political Science, and Ms Olivia Ezeobi of the

Department of Economics, the book entitled *Covid Diaries: Women's Experiences of the Pandemic* serves as an important archive that documents women's voices amid the unfolding health crisis and the statistics that abound around it.

"It is a book about women, a piece of history, but in women's own voices, their own lived experience," explains Ezeobi, a lecturer and PhD candidate whose research interest is feminist economics.

"Giving voice to' is a cardinal feminist ideal. So often women's voices are silenced, or their stories erased. This book creates the space for voice," adds Gouws.

The stories are categorised into five sections: "The Political is Personal", "The Personal is Political", "A Woman's Work is Never Done", "Of Motherhood and Care" and "The Body on the Front Line".

The sections deal with what the political conditions in which the lockdown ensued meant to people on a personal level, women's ever expanding care burden under the pandemic, and the compounding effect of the pandemic on other health related issues, such as mental health, aging, and cancer, as well as hopeful and uplifting stories.

The editors say they hope that the book might be cathartic and even therapeutic to many readers, as they may be able to recognise their own experiences in some of the essays.

"What struck me about all the stories is how beautifully they are written. There is exquisite language use in some stories in a way that you can see and feel the experience of the writer. It comes from a place deep inside, from being unsettled in ways that needed to find an expression in language," says Gouws.

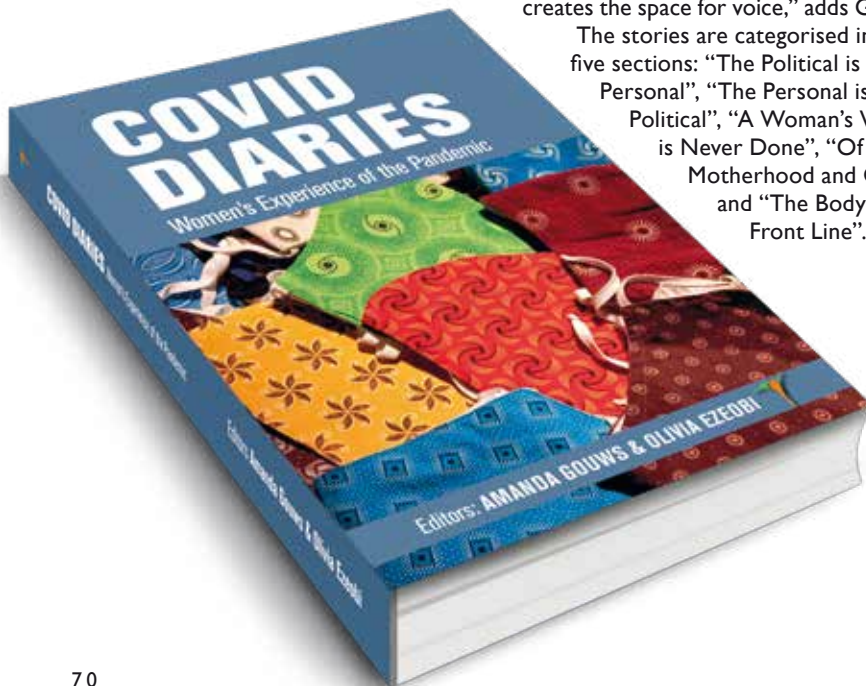
Ezeobi describes some of the essays as "brutally honest and vulnerable".

"The essays are about lived experience. These are the realities for these women, or the women they work with/for as activists and counsellors. The value is seeing the human every-day side of the impact of COVID-19 and lockdown, in women's own voices."

"It is also a reflection on how we were forced into a digital world to become 'cyborgs' – the merger of human and machine. I argue that this pandemic is a corrective for human beings' neglect of the planet, of an ethic of care in an integrated ecosystem," she says.

The book is published by Imbali Academic Publishers and available from leading bookshops. Its publication was made possible through NRF funding for the SARCHI Chair in Gender Politics. For more information, contact Ms Olivia Ezeobi ([olivia@sun.ac.za](mailto:olivia@sun.ac.za)) or Prof Gouws ([agl@sun.ac.za](mailto:agl@sun.ac.za)). Readings from the book will be available in podcast format on the SARCHI Chair blog: <https://amandagouws.squarespace.com/>

*Covid Diaries* is dedicated to women who are frontline workers in recognition of their courage, and also to Prof Gouws' daughters and Ms Ezeobi's parents.



## STUDY PROBES COVID-19 IMPACT ON WOMEN ACADEMICS

**A STUDY TITLED ‘GENDER INEQUALITY IN THE SHADOW OF COVID-19’, FOCUSING ON THE IMPACT OF THE COVID-19 LOCKDOWN ON WOMEN ACADEMICS WAS DONE BY PROF JONATHAN JANSEN, FROM SU’S DEPARTMENT OF EDUCATION POLICY STUDIES, AND HIS TEAM. THE STUDY SAMPLED THE RESPONSES OF 2 029 WOMEN ACADEMICS AT SOUTH AFRICAN UNIVERSITIES.**

Academic work increased and intensified for women working under lockdown conditions due to the additional teaching and support they had to provide. Every participant in the study reported that their academic administration workload increased dramatically. This brought about intellectual and health challenges.

Working from home had a negative effect on women’s academic work because of the demands of this new working environment (such as chores and taking care of children). The home space was also often congested and competitive, with people scrambling for broadband access. This had a huge impact on these women’s productivity, according to the results.

The disruption of women academics’ work has made jobs and careers (including probation and promotions) more precarious than before. This has caused much anxiety and stress.

Most women in heterosexual relationships reported they defaulted to traditional family roles even when a husband was present or helpful. This increased the pressure on their academic work and led to them overworking in order to catch up.

All the participants in this study felt that the academic productivity of male academics continued to flourish despite the pandemic. This finding, consistent with COVID-related research in other parts of the world, has massive implications for gender equality.

The single most important factor impacting on women’s academic work is the presence of young children in the home. This was especially debilitating during hard lockdown when schools were

closed and domestic help was unavailable. The feelings of guilt associated with balancing both roles were constant for participants in the study. This also led to a sense of helplessness.

Women academics took on nurturing roles to support anxious students and students in need, often working late into the night responding to emails. This had a devastating impact on their academic work, particularly research. Despite the pandemic, the demand for academic performance from university management continues as if nothing has happened, according to the results.

Jansen said the study is unique in that it provides a research basis for anecdotal claims, “which not only backs up these claims but also gives them more complexity and nuance”.

He is drafting a policy brief to colleagues at other universities to recommend steps that can be taken to mitigate the academic and health risks impacting women in academics. This includes offering grant funding to women to help them cope, and readjusting the academic calendar with regards to probation and promotion.



# DISABILITY CONSIDERATIONS AMIDST A PANDEMIC

**OFTEN, PEOPLE WITH DISABILITIES ARE LEFT BEHIND IN EMERGENCIES.**

**THIS IS A SERIOUS RISK IN THE ONGOING PANDEMIC AS APPROXIMATELY**

**3,8 MILLION SOUTH AFRICANS HAVE SOME FORM OF DISABILITY.**

In a mixed-method study<sup>32</sup>, Dr Lieketseng Ned (Centre for Disability and Rehabilitation Studies, SU), Dr Emma Louise McKinney (Interdisciplinary Centre for Sports Science and Development, University of the Western Cape), Dr Vic McKinney (Department of Health and Rehabilitation Sciences, University of Cape Town) and Prof Leslie Swartz (Department of Psychology, SU) explored the experiences of vulnerability of people with disabilities and the impact of COVID-19 on their organisations in South Africa. The researchers also aimed to identify possible strategies and recommendations for disability-inclusive pandemic responses.

To collect data, an online survey was distributed through disabled people's organisations and other disability networks countrywide. To obtain more narrative data, follow-up interviews were conducted with selected persons with disabilities and with organisational representatives who availed themselves.

This article<sup>33</sup> reports on the responses of persons with disabilities only. Survey responses were received from persons in 8 of the 9 South African provinces, with the majority of respondents (52%) being from the Western Cape. For the interview aspect of the study, 14 persons with disabilities were interviewed. Those living in more remote circumstances were less able to participate in the research due to a lack of technology, infrastructure and connectivity. As such, the researchers concede that the study was less inclusive than a face-to-face process would have allowed.

## Respondents' experiences

The findings reveal the experiences of respondents around the following topics:

access to information about COVID-19; access to health facilities and continued health services; access to social services; participation in decision-making through disabled people's organisations; and government involvement.

While generic information on COVID-19 was found to be helpful, there was limited to no targeted information provided to persons with disabilities. Respondents felt that most information was not tailored to their specific disability or needs. The majority of the president's briefings did not even have sign language interpreters or captions. Rapid access to general and targeted disability-specific information is crucial to ensuring that all persons with disabilities and their families are well prepared to protect themselves and access the information that they need.

Vital disability-specific health services were not regarded as 'essential services' and were therefore interrupted, which placed people with disabilities at a heightened risk. Fifty-nine per cent of the respondents required constant medical supplies, while 64% were on regular medication, yet hospital appointments were either cancelled or postponed. While some relied on the delivery of medication, this service was not accessible to all.

Sign language interpretation services, assistive devices and related maintenance services, rehabilitation services and therapeutic interventions were also not regarded as essential and therefore not always available.

Of those respondents who were employed (59%), some (36%) had to stop working, while others (6%) had to change the nature of their jobs, thereby heightening financial and livelihood insecurity. As such, many lost some or

all of their income and could not afford personal assistants.

While provision was made for transitioning to online learning platforms, those respondents who were studying reported that anxiety, an increased workload, poor communication and connectivity problems affected their school performance.

Other challenges included the inability to put on masks independently, communication barriers imposed by masks for those who rely on lip-reading, and difficulties with social distancing as some people with disabilities require personal assistance (carer support) for daily living, while others are dependent on touching surfaces to navigate everyday life.

Combined, these experiences triggered fears, anxiety, worry and obsessing about contracting the virus, all of which contributed to poor mental health.

Fifty-four per cent of respondents were not aware of any government assistance for persons with disabilities during the lockdown period. Forty-five per cent of respondents who were affiliated with or members of disabled people's organisations, however, reported receiving significant assistance from their organisations. This took the form of information provided via newsletters, social media, emails or telephone; regular check-ups for mental and emotional support; the provision of food parcels; and funding assistance for medication and doctors' appointments.

## Paving a more inclusive way forward

What we see from these findings is that, while inaccessible healthcare systems and the presence of underlying health conditions put people with disabilities at additional risk of contracting COVID-19, this vulnerability is exacerbated by other factors such as systematic exclusion and environmental barriers at different levels.

The findings also expose the exclusion of persons with disabilities in the government's responses to the pandemic.



Both disability mainstreaming and targeted efforts are needed to ensure that pandemic responses are made disability-inclusive from the planning stage onwards. Key to this is meaningful consultation with persons with disabilities, as well as data collection on disability to allow data disaggregation.

The researchers reiterate that contextual factors and the prevailing systemic issues that de-prioritise persons with disabilities simultaneously position them at a higher risk of contracting the virus and deepen inequalities.



# PROJECT MAKES COVID-19 INFORMATION ACCESSIBLE TO THE DEAF COMMUNITY

**A PROJECT THAT AIMS TO MAKE INFORMATION ABOUT COVID-19 AVAILABLE TO THE SOUTH  
AFRICAN DEAF COMMUNITY VIA INFORMATION VIDEOS HAS BEEN LAUNCHED BY SU'S DEPARTMENT  
OF GENERAL LINGUISTICS.**

The COVID-19 project was initiated by third-generation deaf sisters Vanessa Reyneke and Stephanie Lotz, who received numerous pleas for accessible information on COVID-19 from members of the Deaf community. Reyneke is the coordinator of a project of the Department aimed at developing South African Sign Language (SASL) teaching and learning support material for use in schools for the Deaf.

According to Prof Frenette Southwood of the Department, their research has


shown that there are a limited number of resources on COVID-19 available in SASL, compared to those available in spoken languages. "Without translation of important information into the only language fully accessible to them, members of the Deaf community are becoming increasingly vulnerable during the COVID-19 pandemic," she says.

The Department received permission from the Western Cape Government to use their infographics as background in the Department's SASL video recordings,

as well as their written information as a point of departure in the sign language scripts. The Department is also using the information made available by the Knowledge Translation Unit at the University of Cape Town.

## **Different phases with different purposes**

The first phase of the project focused on the most important health topics. It included information on keeping safe, as well as advice and guidelines on what to



do when you are COVID-19 positive. The second phase will involve the production of a COVID-19 information package suitable for schoolchildren.

Topics to be covered in subsequent phases include how to protect yourself

(especially at school and when using public transport), what to do if you are COVID-19 positive, and who to ask for help. Updates will also be provided

on those topics already covered during previous phases of the project.

"The first information videos were released on 19 February 2021. We have identified a list of topics to cover, but we are also led by the needs of the Deaf community," says Southwood. For instance, a survey amongst those who watched the videos has shown that information about the vaccine was sorely needed, resulting in this topic being covered earlier than originally planned. Members of the Deaf community also indicated that they had very specific questions around certain health matters related to COVID-19. Upon their request, video-recorded question and answer sessions were arranged. Their questions were pre-collected via Facebook and presented to medical experts, whose answers were interpreted into SASL.

So far, 30 videos have been released. The COVID-19-related information is made available in two varieties of SASL. This is because members of the older Deaf generation, who were schooled using sign-supported English or sign-supported Afrikaans, do not necessarily understand SASL well, and need the information in an adapted version.

According to Reyneke, she and her sister would like the project to reach every individual in the Deaf community. "The ultimate goal is to ensure that the Deaf community has access to all information needed for their daily well-being during this pandemic, and in all varieties of SASL if possible," she says.

"We hope that other public and private sectors will also be inspired by this initiative and be encouraged to ensure that everyone has fair access to their surroundings," she adds.

The COVID-19 information videos are uploaded on YouTube and a Facebook page for the Deaf community to access free of charge. They are also available on SU's website and social media platforms. Individuals can subscribe to the relevant YouTube channel to receive alerts when new videos are uploaded.

SU is funding the current project. Plans are also in place for a Deaf-friendly series on emotional wellness in the time of the pandemic, to be funded by the Lewis Group.







# CREATIVITY AMIDST CRISIS

Music-improvising practices amidst social distancing and lockdown..... 78

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# MUSIC-IMPROVISING PRACTICES AMIDST SOCIAL DISTANCING AND LOCKDOWN

**HOW DOES A COLLECTIVE OF MUSICIANS EXPLORE THE CHALLENGES  
OF MUSIC IMPROVISATION DURING LOCKDOWN WHEN FACE-TO-FACE  
INTERACTIVE MUSIC-MAKING IS IMPOSSIBLE? ARE MUSICIANS STILL  
ABLE TO MAKE MUSIC TOGETHER AND IF THEY DO, WHAT ARE THE  
TYPES OF TECHNOLOGICAL, SOCIAL, MUSICAL AND GEOPOLITICAL  
KNOWLEDGE THAT SURFACE?**

These are some of the questions that are emerging from an artistic research project amongst musicians at SU's Africa Open Institute for Music, Research and Innovation (the AOI), under the guidance of principal investigator Prof Stephanus Muller. The collective started engaging in improvisational practices before restrictions on proximity were imposed by COVID-19 social distancing and lockdown. The project continued remotely throughout the lockdown and is still ongoing as a creative process of music-making and research.

The improvising collective was established early in March 2020 by AOI affiliates Dr Esther Marié Pauw, Garth Erasmus and Pierre-Henri Wicomb. Over the past year, practitioner-researchers have included Dr Visser Liebenberg, Dr Cara Stacey, Dr Carina Venter, Dr Stephanie Vos, Cristelle van der Merwe, Tertius van der Merwe, Jill Richards and Neo Muyanga. The collective welcomes former and newcomer musicians to play along for an hour-long session once a week.

At present, the collective is exploring hybrid forms of playing both online and in person. Although most of the playing still occurs online, a brief artistic group residency (that Erasmus and Pauw shared at the Stellenbosch Institute for Advanced Study in the spring of 2020) allowed for experiments with live group playing connected to online playing so that a

player like Cara Stacey in Johannesburg could join the live sessions.

## **Technology for time lag and fragmented sensory information**

The collective's playing makes use of laptops, earphones, the recording of one's own online playing with equipment such as ZoomHandy6 recorders, and a process of editing to creatively navigate online time lag and incomplete sonic signal

connections between co-players. A grant provisioned by the Faculty of Arts and Social Sciences (for research in response to the COVID-19 pandemic) was used to purchase some of the equipment that enabled experiments regarding playing under lockdown circumstances.

The process devised for capturing, editing and publishing the improvisation is unique in its recognition of creative work that happens virtually, even though players may not have received the totality of the real-time signals that were sent. Wicomb, who synchronises the individual tracks and edits them to remove unintended household noises, comments that players experience the live improvisation as 'their solo', interspersed with fragments of sonic input during the online meeting. He suggests that the collated sound piece comes as a surprise when it reveals what was created jointly, virtually, and captured as an actuality through technology.

Wicomb publishes the pieces on the *Soundcloud site of Africa Open Improvising*<sup>34</sup>. They contribute to an international



Africa Open Improvising

Online Play 19\_2021-08-04 PH, G



1



Repost



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More

online community's documentation of and discussions about sound improvising installations.

### Studying 'distanced' play

To investigate the challenges and opportunities that arise around 'distanced play', the AOI's improvising musicians are not only creating sound files that are available online, but also engaging in self-reflexive practices and publishing on international academic platforms.

Liebenberg has compiled an interview with members of the collective, on grounds of which a publication in *INSAM Journal of Contemporary Music, Art and Technology* is forthcoming. In addition, four of the musicians (Wicomb, Stacey, Pauw and Erasmus) partook in the Australasian Jazz and Improvisation Research Network Conference in June 2021 to present their collaborative work.

In the project undertaken by the Africa Open Improvising collective, knowledge gained through sound-making and reflection on these creative acts continues to inspire the artistic researchers involved. The collective's approach underscores that any player that participates is also an active researcher, and that all material produced is available for further creative work such as sampling,

**The process devised for capturing, editing and publishing the improvisation is unique in its recognition of creative work that happens virtually, even though players may not have received the totality of the real-time signals that were sent.**

The practitioner-researchers are finding that their improvisations 'play out' amidst mutual dependency of playing and listening, engage sonic signals of uncertainty, and make do amidst the near-absence of proximity.

Conclusions thus far drawn from various levels of data collection inform research aspects regarding technology and the sounding body in particular. It also informs research around sonic relations that engage collaboration from geographically distant platforms, and from platforms that are ideologically distant in a world perceived as socially, materially and politically unequal.

### An invitation to hear and reflect

Readers are invited to listen to the collective's music-making on the *Africa Open Improvising site*<sup>35</sup> and explore some

of the written comments (that are activated through the art detail panels of Jarrett Erasmus).

Listeners may find themselves wondering what a 'zahn' or a 'pannerak' is. They may be intrigued by clarinet sounds that split into multiphonics, or react defensively to machine-like noises. They may also wonder about unequal resources of available virtual connectivity and home sonic spaces that suit recording sessions. Some of the answers, and more questions, may be found through individual hearing and sense-making processes as unique listening reactions to improvised sound installations.

E, EMP, ML, LT

8 days ago

# free-improvisation



▶ 31



# SPIKY BLOBS WITH EVIL GRINS

## CORONAVIRUS VISUALISATIONS IN NEWSPAPER CARTOONS

**HEARING THE WORD 'CORONAVIRUS' USUALLY CONJURES UP A PICTURE OF A SPHERICAL OBJECT SURROUNDED BY A HALO OF PROTRUSIONS. THIS MENTAL IMAGE IS A RESULT OF WHAT WE SEE IN THE MASS MEDIA AND MAY BEAR LITTLE RESEMBLANCE TO WHAT THE NOVEL CORONAVIRUS ACTUALLY LOOKS LIKE IN AN ELECTRON MICROGRAPH.**

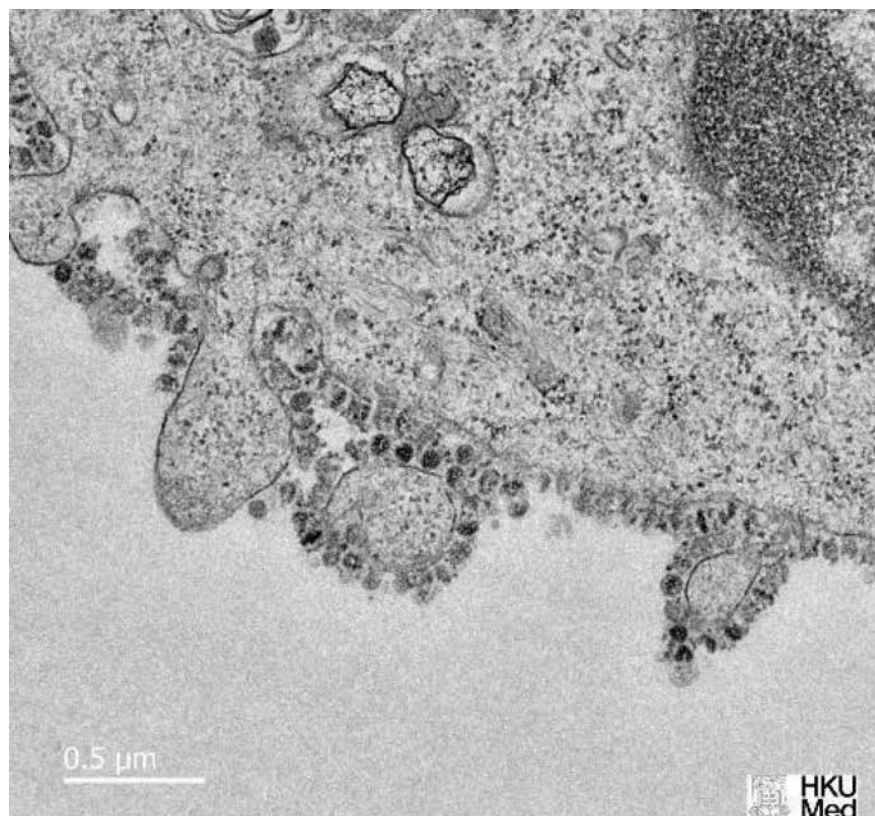


Figure 1: An electron microscopic image of the 2019 novel coronavirus. (Source: The University of Hong Kong)

As part of a larger study of media coverage of the COVID-19 pandemic, SU science communication researcher Dr Marina Joubert collaborated with University of Cape Town media studies scholar Prof Herman Wasserman to explore how South African newspaper cartoonists portray the novel coronavirus. Their study<sup>36</sup>, published in December 2020, also explores the origins of virus visualisations and provides a brief overview of the historical milestones that paved the way to our current virus imaging capabilities.

### From fact to depiction

When processing data retrieved from an electron microscope into a visible image of a virus, scientists and artists make certain arbitrary choices. During this process, the novel coronavirus is 'transformed' from a black-and-white image (Figure 1) to a colour-stained image (Figure 2). The structure and morphology of the virus may be enhanced in a graphic representation (Figure 3).

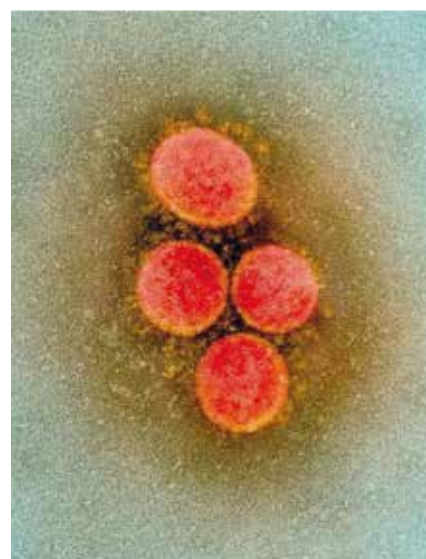


Figure 2: Colour-enhanced transmission electron micrograph of SARS-CoV-2 virus particles. (Source: The National Institute of Allergy and Infectious Diseases)



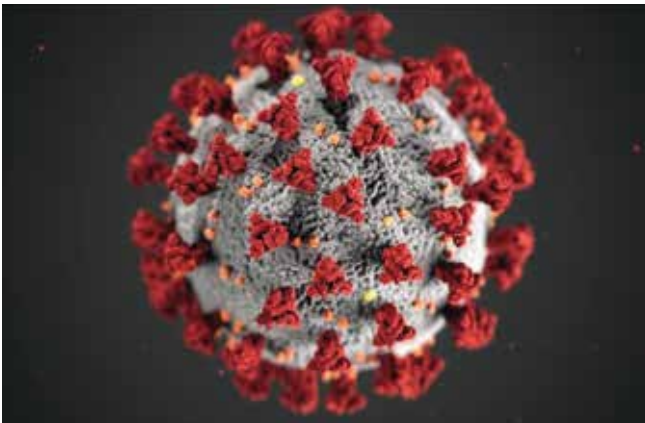


Figure 3: An illustration of the ultrastructural morphology exhibited by novel coronaviruses. (Source: Centers for Disease Control and Prevention)

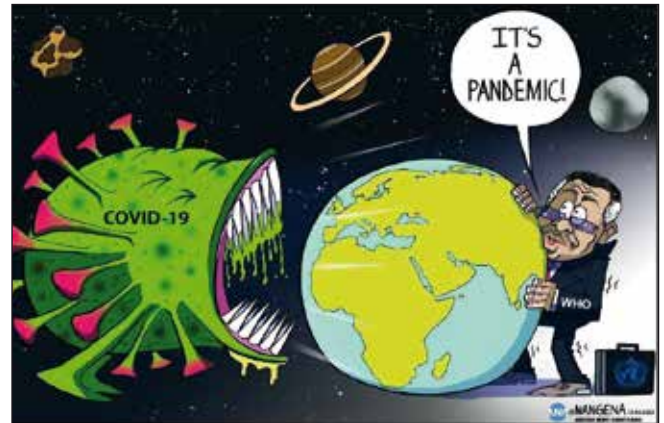


Figure 4: A cartoonist's portrayal of the novel coronavirus: "It's a pandemic!", by Bethuel Mangena. Published in The Star on 13 March 2020. Used with permission.

Editorial cartoonists typically exaggerate the physical characteristics and colours even further, and may also add human characteristics and emotions, using anthropomorphism as a rhetorical device (Figure 4). While cartoonists' portrayals are not scientifically accurate, they are persuasive and rich in visual rhetoric, thereby contributing to the creation of meaning around the virus. From 1 January to 31 May 2020, there were 497 COVID-19-related cartoons included in 15 print and online newspapers published in South Africa, with an illustration of the coronavirus present in 120 (24%) of these cartoons. The virus was typically coloured green or red and given human characteristics (most often evil-looking facial expressions), with exaggerated, spiky stalks surrounding its body. (See Figure 4 as an example.)

Anthropomorphism (the attribution of human characteristics to non-human entities) was present in more than half of the 120 cartoons in which the virus was illustrated ( $n = 70$ ; 58%). The dominant emotional tone of the cartoons was one of fear, often including depictions of death in the form of the Grim Reaper (an animated human skeleton draped in black robes and carrying a scythe, regarded as a manifestation of death in popular culture). In their article, the researchers discuss the potential implications of these depictions, and analyse how the cartoons commented on the socio-political and economic impact of the virus on South African society. For example, the cartoon

in Figure 5 alludes to a dark comedy musical film from the 1980s called 'Little Shop of Horrors'.

Here, the coronavirus assumes the role of the insatiable monster plant and President Cyril Ramaphosa is forced to feed it jobs, the economy, small to medium enterprises and individual freedoms.

In addition to providing a memorable 'hook' onto popular culture, this cartoon links the anthropomorphic depiction of the virus to broader socio-economic

concerns about economic devastation and to debates about the erosion of democratic freedoms during the stringent lockdown regulations.

In the next phase of this research, the team will focus on the thematic framing of South African editorial cartoons on the topic of the COVID-19 pandemic published over the entire course of 2020. How this comments on the political and societal impacts of the pandemic will be at the forefront of the analysis.



Figure 5: "Feed me, Cyril!" by Dr Jack & Curtis. Published by Eyewitness News (EWN) on 17 March 2020. Used with permission.







# **(NOT) BUSINESS AS USUAL**

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# LEADING AMIDST A PANDEMIC

**NOT ALL BUSINESS LEADERS ARE HANDLING THE WORKPLACE CRISES CAUSED BY COVID-19 EQUALLY WELL, WITH THOSE WHO COMBINE A WAR-LIKE APPROACH WITH HUMANITY AND COMPASSION PROVING THE MOST EFFECTIVE, SAY THEIR EXECUTIVE COACHES IN A RECENT STUDY<sup>37</sup>.**

**D**r Nicky Terblanche, a senior lecturer in management coaching at the University of Stellenbosch Business School (USB), interviewed 26 executive coaches across South Africa, the UK, the USA and Australia to reveal what effective leadership in a real-time crisis looks like.

## **Even leaders need leadership**

"The saying 'When the tide goes out, you see who's been swimming naked' appears to be true from a leadership perspective during this pandemic. In times of crisis, leaders are severely tested. What is evident is that not everyone is coping," observes Terblanche.

He says the pandemic is increasingly exposing weak leaders: "Some senior leaders who were able to 'hide' before have already been demoted or pushed aside because they are not up to the job. This, of course, places enormous pressure on the people who have to take over their roles."

Terblanche was surprised to learn that several middle managers in large South African organisations were not receiving the expected guidance, communication and support from their superiors, with management coaches filling the gap instead.

"Their leaders were 'missing in action', leaving it up to [these mid-level] managers to figure things out. Many

coaches in the USA found themselves fulfilling the role of a manager in having to assist their clients in thinking through and finding answers to operational problems due to leaders' inability [to do so]."

## **A (tempered) war-like approach**

"By communicating frequently and clearly, leaders can be directive and provide focus to the team. In a crisis, followers want a reassuring leader who can point the way," Terblanche says.

"However, war-like directiveness must not be confused with control. A war commander cannot control all aspects of a war. Instead – after communicating uniform direction, and setting clear values and expectations of how [the team is going] to function – leaders must know when to step aside and trust that their followers will execute.

"This is certainly not a comfortable space for those who have a micromanagement style. With remote working, anxiety can build up if leaders are used to relying on 'looking over their staff's shoulders' to stay in control."

Terblanche furthermore uncovered that a war-like directive leadership style should not come at the price of showing a humane, compassionate side.

"People may forget what you said, but they will remember how it made them feel. If the leader has always shown compassion for staff long before the

pandemic, their caring stance should pay off during this uncertain time and reduce levels of anxiety," he explains.

"Leaders who show their vulnerable side in confessing that even though they don't have all the answers, they are working collectively with the entire team on solutions and coping strategies, will instil a sense of focus and reassurance amongst staff."

In such situations, however, leaders must refrain from subconsciously projecting their fears onto their staff. "Make sure you understand your own fear and anxieties before you communicate with your team," says Terblanche.

The research clearly warns against the perils of information overload and resultant radio silence. "Good leaders in this time are the ones who can sift through the piles of information [available] and use holistic and systems thinking to try and see the bigger picture. This is not the time to be overwhelmed and become insular [...] to frantically plan without communicating with the team, thereby leaving staff in a state of limbo."

## **Leaders struggling with identities**

During this time of crisis, coaches are observing that leaders are increasingly struggling with their own identities. In some instances, leaders are forced to act in ways that violate their own value systems.

"On a very pragmatic level, leaders are struggling with their identities due to the physical change in their work environment. Some identify strongly with their corner office or the respect shown by staff when they enter the building, but now they are at home, in certain cases having to share domestic duties and school children from home. No more jetting off – business class – all over the world. It's about moving off one's pedestal towards [the attitude of] 'we are all in the same boat, or at least trying to weather the same storm,'" Terblanche says.

The study showed that resilience is most probably the deciding factor in whether or not leaders will indeed be able to survive the storm.

"Resilient leaders are those who can consider the bigger picture, who look beyond the doom and gloom and seek



opportunities. Leaders who have studied and understand systems thinking and complexity theory seem to manage better and are able to see opportunities. Also, those who draw on their experience from challenges faced (such as civil wars or the 2008 financial crisis) are far better placed,” Terblanche explains.

A prime example of a resilient leader is the client of one of the USA coaches who regards the pandemic from the viewpoint of ‘Never waste a good crisis’, actively looking for new opportunities for his organisation.

According to Terblanche, part of maintaining resilience is looking after oneself. Coaches from all four countries found that the leaders who are coping best with this pandemic are those who are making a concrete effort to maintain their personal well-being. “Strategies include exercise, eating healthily and finding the right balance between working from home and family responsibilities,” Terblanche says.

### **The role of coaching**

A major benefit of coaching during this time of crisis is the opportunity to help leaders to stop and reflect, to “move from the dance floor to the balcony”, as one of the interviewed coaches aptly described it.

“Coaches guide leaders to not only think and make plans but firstly to make as much sense as possible of what is happening on multiple levels,” Terblanche

explains. Coaching sessions have always been a powerful space for leaders to reflect (guided by a professional who can use theories and frameworks from psychology and adult learning), to sift through information, and to consider different perspectives and have their assumptions challenged.

“Only once a situation is properly understood can effective plans be made,” Terblanche concludes.

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**However, war-like directiveness must not be confused with control. A war commander cannot control all aspects of a war. Instead – after communicating uniform direction, and setting clear values and expectations of how [the team is going] to function – leaders must know when to step aside and trust that their followers will execute.**





# PANDEMIC FORCES BUSINESS LEADERS TO ASK NEW QUESTIONS

**AS THE COVID-19 PANDEMIC SPREAD ACROSS THE WORLD, MANY COUNTRIES WENT INTO LOCKDOWN, WITH ONLY ESSENTIAL SERVICE BUSINESSES AND WORKERS BEING ALLOWED TO OPERATE AND MOVE AROUND. IN SOUTH AFRICA, MOST BUSINESSES CLOSED THEIR OFFICES AND TODAY STILL, EMPLOYEES WHO CAN ARE WORKING FROM HOME.**

**T**he impact on economies has been devastating and the world as we knew it has changed dramatically.

According to Dr Morné Mostert, the director of the Institute for Futures Research (IFR) at SU, this new world shaped by the COVID-19 pandemic is forcing business leaders “to ask new questions” in order to secure their sustainability.

The main purpose of the IFR is to investigate long-term risks and opportunities, specifically for businesses and large organisations.

“Our belief is that businesses should use this very difficult time to be creative and not just freeze and hope for the pandemic to pass,” says Mostert. “Part of this creativity entails using this time for experimentation.”

He says businesses have to ask themselves what experiments they can do so that once they get out of this crisis, they are not trying to restart the old pre-pandemic world but “leading a new world”.

Based on the collective experience and expertise of the IFR’s staff, the institute recommends treating the situation we find ourselves in as an experiment. “In other words, find something you are curious about, develop and test [ideas] around it and then decide if what you have discovered is useful for the future of your business.

“Part of making better decisions is to test some of the old assumptions about your business. It invites an intellectual approach that requires you to respond

creatively to [... what was previously] business as usual, not so that you can change everything, but so that you can be discerning in the kind of decisions you make for the future.”

## **Unplanned experiments and ensuing questions**

“The first kind of shift that we’ve seen with the pandemic and subsequent lockdown is the rapid acceleration in digitisation. Everything that wasn’t online before the outbreak, from a business perspective, has now become digital. From the customer perspective, many of their transactions with businesses have moved online,” says Mostert.

Working from home, he says, has essentially become “a global experiment in the efficacy of working remotely”. All universities and those schools that can afford it, have replaced face-to-face teaching and learning with online alternatives.

“The point is that in the 400 000 years that we have existed, we have never experienced a crisis of this proportion. This will be the first generation of managers, students and learners that are forced to learn and work in this way, and the truth is we don’t really know how best to do it.”

All of these changes, says Mostert, will lead to new research about things we have never had to think about before.

“While we are in the age of technology, the pandemic is forcing us to ask new questions about the dynamics of interpersonal relationships, such as:

What is the power of meeting with someone face to face? It’s a question we’ve never had to answer in a scientific way because we’ve had the luxury of doing it before.”

People are also now painfully aware of the unsustainability of limitless growth and consumption.

“A pandemic like this also makes us question the idea of limitless growth and whether a new type of balance is possible, especially with regards to the relationship between business and the environment. This pandemic is another nudge for businesses to revisit the relationship they have with the environment and [to consider] whether the exploitation of nature is a sustainable strategy to keep the myth of limitless growth alive.

“We are a creative species, and the notion of development appears innate. But crude, ill-considered, one-dimensional growth at all costs will not solve our complex problems, and has created many others. Creative and systemic solutions are needed for a more balanced planetary trajectory.”

## **Five themes to guide crises responses**

Ironically, the establishment of the IFR came about due to the same discussions that are happening in society today around limitless growth and its impact on the environment. In the early 1970s, representatives who would later establish the IFR attended the first meeting of The Club of Rome, which aims to address the multiple crises facing humanity and the planet by tapping into the collective expertise of scientists, economists, business leaders and former politicians globally.

Mostert was recently appointed as a member of this organisation, which is focused on five themes. The first theme focuses on “how to reclaim and reframe economic systems in order to move beyond GDP as the exclusive measure of economic growth,” explains Mostert. “Secondly, we are focusing on the new, emerging civilisation, which includes the implications of the well-being economy. The third [theme] is the climate emergency. During the worldwide lockdown, we have seen what is possible

from the amazing reductions in our carbon footprint.”

“The focus of the fourth theme is on rethinking how we provide people with access to finance so that they can create employment for themselves and others,” says Mostert. The last theme focuses on the youth and how to develop in them the requisite skills to address the five themes in the future.

“Interestingly, these five themes respond to many of the challenges we are facing in the pandemic today,” he concludes.

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**“We are a creative species, and the notion of development appears innate. But crude, ill-considered, one-dimensional growth at all costs will not solve our complex problems, and has created many others. Creative and systemic solutions are needed for a more balanced planetary trajectory.”**

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# BUILDING RESILIENCE, FINDING SOLUTIONS

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# INNOVATIVE OXYGEN TREATMENT SAVES LIVES AND HEALTHCARE RESOURCES

**IN THE MIDST OF THE COVID-19 PANDEMIC, DOCTORS AT TYGERBERG HOSPITAL IMPLEMENTED A DARING, LESSER-KNOWN TREATMENT THAT NOT ONLY BYPASSED THE IMMINENT VENTILATOR SHORTAGE CAUSED BY THE MANY CRITICALLY ILL PATIENTS BUT ALSO POTENTIALLY SAVED THOUSANDS OF LIVES, WHILE PROVIDING A MORE PATIENT-FRIENDLY EXPERIENCE.**

In a collaborative research *article*<sup>38</sup> published in The Lancet's *EClinicalMedicine*, medical experts from SU and the University of Cape Town (UCT) described how they were able to successfully treat half of all their critically ill COVID-19 patients by using high-flow nasal oxygen (HFNO) and avoiding mechanical ventilation.

HFNO is a non-invasive oxygen therapy that channels oxygen into the lungs through nasal tubes at a high flow rate – up to 60 litres per minute. HFNO is considered to be 'gentler' on patients than mechanical ventilation and allows patients to eat, talk and engage with others. Ventilation, on the other hand, is an invasive treatment that requires a tube to be inserted into the patient's airway. This can cause severe discomfort and necessitates sedation in some patients.

When the first COVID-19 patients with acute respiratory distress were admitted to Tygerberg Hospital's intensive care unit (ICU) in March 2020, doctors treated them according to the internationally recommended regimen of mechanical ventilation. In line with international trends, there were high mortality rates among ventilated patients.

"The first seven patients all received ventilation and, unfortunately, all of them died," recalls Dr Usha Lalla, who manages the COVID-19 ICU. "I remember the day so clearly – two of the patients died on the same day, and the ICU [staff] were in tears," says Lalla, who is also an internal

medicine specialist in SU's Faculty of Medicine and Health Sciences.

At that time, a few anecdotal reports started emerging about the use of HFNO therapy in COVID-19 patients, but generally, there was a reluctance to use this lesser-known treatment.

"I remember discussing it with colleagues, including Prof Mervin Mer from Wits University, and saying that 'a large proportion of the patients just need oxygen – why don't we try it?'"

"The first patient we treated with HFNO was up and chatting on her cell phone within five days, in stark contrast to patients who have to be ventilated for two to three weeks," Lalla says. "This gave us hope that we might not experience the carnage seen in other parts of the world."

The dedicated COVID-19 ICU treated more patients with HFNO and achieved much higher recovery rates with this new treatment than by going straight to mechanical ventilation. News of the success of HFNO therapy quickly spread to other hospitals in the Western Cape and, later, around the country, where it was also rapidly adopted. This modality was also implemented at Cape Town's 'Hospital of Hope', where engineers had to adapt the infrastructure at short notice to accommodate this new therapy. This is an emergency field hospital that opened its doors as one of the first COVID-19 field hospitals in the country in June 2020.

## Extra weapon in doctors' arsenal

"HFNO does not replace mechanical ventilation, which is still extensively used in the management of COVID-19 patients but provides an extra weapon in doctors' arsenal in the fight against the pandemic," says Prof Coenie Koegelenberg, a pulmonologist who works in Tygerberg Hospital's COVID-19 ICU.

"For a resource-constrained setting in the midst of a pandemic, this had a massive impact on the management of patients," says Koegelenberg.

Unlike mechanical ventilation that has to be managed in the ICU, HFNO can be administered in the general ward if the hospital's infrastructure provides for the higher flow of oxygen required. Furthermore, it can be safely managed by non-ICU-trained doctors and nurses, saving on the country's sparse healthcare resources.

The doctors from SU (Tygerberg Hospital) collaborated with Prof Greg Calligaro's team at UCT (Groote Schuur Hospital) to combine data from approximately 300 COVID-19 patients who received HFNO therapy at these facilities. The resulting research article reports on one of the biggest studies to date on HFNO, not only COVID-19 patients but also in patients with any form of pneumonia.

"Our study showed that HFNO can be successfully utilised to avoid the need for mechanical ventilation in half of all patients with severe disease," says Koegelenberg. "These patients fulfilled the criteria for acute respiratory distress syndrome and, if the recommended treatment protocol was followed, would all have had to be mechanically ventilated. Yet, we managed to support them successfully without it."

"High-flow made an enormous difference to our capacity to treat patients during this pandemic. But it was no easy feat changing tack from ventilation to HFNO in the middle of a pandemic," Lalla adds. "Everybody just pulled together – healthcare workers, hospital management, clinical and general engineers and volunteers. Everybody just did what needed to be done... and it was amazing."

# COVID-19: A DILEMMA FOR CONSERVATION IN AFRICA

**WILDLIFE CONSERVATION HAS NOT ESCAPED THE IMPACT OF THE COVID-19 PANDEMIC. THIS IS MAINLY BECAUSE TOURISM FUNDING, WHICH SUPPORTS THE CONSERVATION OF VAST SWATHS OF AFRICA AND PROVIDES AROUND 23 MILLION PEOPLE WITH LIVELIHOODS, HAS ALL BUT DRIED UP.**

Wildlife-based tourism in Africa is worth approximately R980 billion annually. Much of this funds the management of protected areas. For example, the protection of just one white rhinoceros at Kenya's Ol Pejeta Conservancy costs about R138 000 a year.

Since the start of the pandemic, there has been a cut to funds for anti-poaching, surveillance and fence line management in most African reserves. Trophy hunting is a key source of this funding. It contributes an estimated R2,8 billion to economies across the continent annually.

Trophy hunting takes place across much of sub-Saharan Africa. South Africa, Namibia and Tanzania hold the lion's share of this market. The debate over its utility as a source of conservation revenue takes on a new urgency in the light of COVID-19.

## Spotlight on trophy hunting

This industry is facing increasing pressure because it continues to be perceived by many to be grotesque and morally reprehensible. Some have even called for outright bans on hunting. In places like Zambia and Botswana, these calls have resulted in temporary hunting bans. But proponents of blanket bans often fail to consider the broader socio-economic and land use change consequences.

In a recent research project by Dr Hayley Clement from SU's Centre for Complex Systems in Transition, and colleagues from Rhodes University (Kim Parker and Dr Alta de Vos) and Griffith University in Australia (Dr Duan Biggs), researchers tried to understand how an outright ban on trophy hunting would affect landowners with hunting businesses in South Africa. They found that the

majority (91%) of landowners who they interviewed believed that the economic viability of their private land and the biodiversity on it would be lost following a hunting ban. Landowners would move to either scale up ecotourism on their land or change their land use from hunting to domestic livestock farming.

Private landowners who run trophy hunting operations in the Eastern Cape and Western Cape were interviewed. These provinces were chosen because they are considered globally to be important biodiversity hotspots. Some of the landowners interviewed also run ecotourism operations alongside hunting. They were asked about their views on a ban on trophy hunting and ecotourism as an alternative to trophy hunting.

Ecotourism is commonly viewed as a viable alternative to trophy hunting. But in this study<sup>39</sup>, it was found that only a third of the landowners said they would scale up or adopt ecotourism in the face of a hunting ban. The remaining two-thirds believed such a transition to be unfeasible given the financial constraints related to entering and competing in a saturated tourism market. Of the landowners who did not believe ecotourism was a viable alternative, half said they would transition back to livestock farming, retrench some staff members and remove wildlife from their properties. The other half felt that they would have no viable alternative.

## Unintended consequences for wildlife

The results have an important bearing on both conservation and sustainable development. They suggest there is a danger of unintended consequences possibly causing a decline in wildlife

populations. This is because it could result in a smaller number of farmers running wildlife ranches. These ranches play a significant role in species conservation in the country. A recent report showed that South African private conservation land – both formal, privately protected areas and wildlife ranches – covers about 14% to 17% of the country's land area. This is over double that of state-owned protected areas. Also, it shows that a trophy hunting ban could have a significant impact on the livelihoods of landholders and their employees.

Another crucial source of revenue is ecotourism. However, a study done in Zimbabwe more than a decade ago showed that trophy hunting was more resilient than photography tourism because hunters are more willing to travel under risky circumstances than photographing tourists are. These results suggest that hunters will likely be more willing than photography aficionados to start travelling again amidst the risk of contracting COVID-19.

According to the researchers, advocacy groups pressuring policymakers to end all trophy hunting (as well as the use and trade of wildlife) need to consider the potential ramifications of such bans. If an end to trophy hunting is the ultimate goal, the impact on conservation and community livelihoods that depend on hunting needs to be accounted for.

## Towards pragmatic solutions

If conservation is indeed an important goal of those calling for an end to trophy hunting, alternative revenue streams and transition plans need to be developed for landholders and communities where hunting is a key source of income. This will sustain both conservation land use and livelihoods, according to the researchers.

One way to achieve a more pragmatic outcome to the trophy hunting debate is to combine scientific evidence of likely outcomes and different attitudes towards hunting to find acceptable solutions. Finding pragmatic ways to incorporate different views on hunting is critical for rebuilding Africa's conservation sector after COVID-19, the researchers conclude.

# DISASTER RISK RESILIENCE NETWORK STEPS UP TO HELP AFRICA

**AFRICA'S POPULATION IS THE FASTEST-GROWING IN THE WORLD. OVER THE NEXT TWO DECADES, THE CONTINENT WILL ACCOUNT FOR NEARLY HALF OF GLOBAL POPULATION GROWTH. FOR THIS REASON, WHEN DISASTER STRIKES ON THE CONTINENT, ITS EFFECT ON HUMAN LIVES AND LIVELIHOODS IS OFTEN SEVERE, DISRUPTING AND UNDERMINING DEVELOPMENT.**

Fires in informal settlements in Africa's rapidly growing cities spread quickly and lead to deaths and property loss. Flash floods frequently claim many lives and displace thousands of people from their homes. And, as the COVID-19 pandemic has again shown, when disease outbreaks occur, the continent's public health systems struggle to cope.

A platform for university partnerships aimed at reducing disaster risk in Africa has, since 2006, been coordinating and pooling the expertise of higher education institutions across the continent to reduce local vulnerability and build resilience.

From a 2005 pilot project with four institutions from Algeria, Ethiopia, South Africa and Tanzania, the *PERIPERI U network*<sup>40</sup> (an acronym for Partners Enhancing Resilience for People Exposed to Risks) has grown to include 12 universities, from Algiers to Antananarivo. This partnership now also includes institutions in Cameroon, Ghana, Kenya, Madagascar, Mozambique, Nigeria, Senegal and Uganda.

Since the beginning of the global pandemic, the PERIPERI U partners were quick to offer their expertise and resources to assist in national and regional efforts to combat the spread of the virus and protect vulnerable communities.

## Network helps raise awareness

The network has focused its contribution on raising COVID-19 awareness amongst

its partner universities and in their local communities.

According to Alberto Francioli, the project manager at the PERIPERI U secretariat hosted at SU, "PERIPERI U partners based at Makerere University in Uganda have been instrumental in contributing towards the development of their national online platforms for monitoring the pandemic, raising awareness and sharing safety information with the public." Most other partners have used radio messaging to communicate en masse with rural communities, particularly in countries that do not have ready access to local and international news. "Other partners have also developed outreach programmes that aim to serve their communities," he says.

In addition, the network's member institutions are providing essential services and guidance to district and rural populations, which often do not receive as much attention as their inner-city counterparts.

The PERIPERI U secretariat at SU, along with its partners based in western Africa (Ahmadu Bello University in Nigeria and Gaston Berger University in Senegal), has signed an agreement to research the socio-economic impacts of COVID-19 in the Sahel region (specifically Burkina Faso, Chad, Senegal, Niger, Nigeria, Mali and Mauritania). They will also consider COVID-19-related impacts, mitigation and prevention strategies, community and household resilience, and measures taken to mitigate present and future risk of pandemic-type disasters.

As part of the project, SU has been assisting the United Nations Development Programme (UNDP) in developing and piloting an online training short course focused on the COVID-19 Recovery Needs Assessment (CRNA) and recovery planning for academics, NGOs and government officials based in the Sahel project countries. SU aims to host this online CRNA short course on a full-time basis by the end of 2021.

The team from the Research Alliance for Disaster and Risk Reduction (RADAR) at SU has collaborated with provincial and national disaster management authorities to help develop content for online training and short courses to respond to the risk. The RADAR team is also collecting data, keeping a timeline and documenting changes, developments and impacts as the crisis unfolds to enable a proper post-event analysis.

**PERIPERI U partners based at Makerere University in Uganda have been instrumental in contributing towards the development of their national online platforms for monitoring the pandemic, raising awareness and sharing safety information with the public.**



# PEPTIDE-DERIVED MATERIALS TO CURB PATHOGEN TRANSFER

**UNCHECKED TRANSFER OF RESISTANT MICROORGANISMS AND VIRUSES CAN LEAD TO OUTBREAKS OF DISEASES SUCH AS TB, LISTERIOSIS AND COVID-19, WHICH THREATEN GLOBAL FOOD SECURITY AND PUBLIC HEALTH.**

This type of pathogen transfer is especially troubling in the current pandemic since no clear conclusions can be drawn regarding the lifetime of the virus on surfaces. Contaminated surfaces appear to play an active role in infection numbers.

Curbing pathogen transfer must ideally be done without adding unnatural chemicals, more antibiotics or more non-degradable plastics into our environment and health system, and without utilising high-cost instrumentation or implementing costly lockdowns and quarantines.

There is an obvious need for technology that limits pathogen transfer from surfaces and materials. Technology to curb pathogen transfer already exists in nature in the form of antimicrobial peptides that form antimicrobial shields and layers. These peptides are natural antibiotics that have been around for millennia. They are the most abundant weapons of self-defence against microbial and viral infections in nature.

During the last 30+ years of working with antimicrobial peptides, members of the Biopep™ Peptide Group, under the leadership of Prof Marina Rautenbach from SU's Department of Biochemistry, focused their research on natural complexes of small antimicrobial cyclodecapeptides (CDPs) with broad-spectrum antimicrobial activity.

Using certain solvent systems, they found that one of these groups of antimicrobial CDPs (tyrocidines) has an extreme propensity to associate with or to be absorbed into different types of materials, including those that low-cost masks, medical masks and gloves are made of. These stable, natural CDPs tend to stick very tightly in layers to

many types of materials and surfaces when applied with a patented technology. They do not wash off with water, boiling water, organic solvents, buffers or various biological media. Formulations containing these peptides have been in clinical use for decades for treatments of skin and throat infections, so it is clinically safe for skin contact and ingestion.

## **Materials with antimicrobial properties**

Recognising the potential of these CDPs, Prof Marina Rautenbach and her student Dr Wilma van Rensburg developed a patented technology by using the CDPs to create self-sterilising materials and surface treatments that functionalise the surfaces and materials with long-lasting antimicrobial properties. These peptides show good antiviral activity against a variety of viruses in cell cultures (of HIV, human papillomavirus and others) and clinical tests (viral pharyngitis, human papillomavirus). It was recently shown that enveloped and naked viruses, including corona-type viruses, become inactive on various face mask materials treated with these CDPs.

With this technology, the researchers can create low-cost self-sterilising CDP materials and stable CDP solutions to treat surfaces and limit pathogen transfer over an extended time period. Sterilising materials and solutions with these CDPs are stable for up to two years in storage and have applications in the health sector, as well as in the food industry, general industry and private sector.





# SU RESEARCHERS REIMAGINE HOUSING WITH A RETURN TO THE 'KRAAL'

**A RETURN TO THE 'KRAAL' – OR AT LEAST A DWELLING AROUND A CENTRAL COURTYARD AND WATER FEATURE – MIGHT JUST BE THE SECRET TO UNLOCKING SUCCESSFUL HOUSING IN YEARS TO COME.**

This is according to a multidisciplinary team of researchers from across sub-Saharan Africa and, specifically, SU, the University of Cape Town and the Sustainability Institute, who are ambitiously re-imagining housing post-COVID-19.

Sharné Bloem, initiator and project leader of Team Mahali\* and a researcher in the Centre for Complex Systems in Transition at SU, says that their aim is for all new housing to function with a net-zero carbon footprint. This implies housing that is distinctly energy efficient and powered by the on-site or off-site generation of renewable energy. This concept could also be applied to water and waste systems.

## Determined to unlock the future of housing

"The pandemic has brought sharply into focus the need to rethink the very definition of housing – all the more so because our living spaces have become our 'offices' too. COVID-19 made us even more determined to determine the future of housing," says Bloem.

"We were also made acutely aware of the benefits of living with others to combat isolation and depression, and as a way of splitting costs and saving," says Bloem, an expert in 'green' architecture and sustainable communities. "The future most probably lies in our ability to thrive in communal spaces that are centred around producing your own food in an inside-out space while coming together and embracing community living.

"Central to reimagining housing of the future should be that design teams consist of experts from various disciplines – not only the built environment," she added. COVID-19 highlighted the fact that social scientists and philosophers are just as needed in the design of housing and urban landscapes as are the designs of engineers, architects and builders.

Many features of future housing are now topics of further study and research. These include the house being transportable, pest-proof and, importantly, affordable.

Architect, SU alumnus and Mahali team member Wimbayi Kadzere, says that the pandemic emphasised the

importance and effectiveness of space, natural light and ventilation in buildings.

"The configuration of spaces in the Mahali houses takes place around a central courtyard that regulates the air and light quality within those spaces and supports reduced energy consumption. Ultimately, it encourages the wellness of occupants without the added costs of mechanical ventilation and lighting," she says. This contributes towards the reduction of greenhouse gas emissions.

Kadzere further reinforces the intimate connection shared between housing, health and well-being. Through various techniques, the sustainability initiative of the building enhances the comfort of the occupants. Occupant comfort considers a space's air temperature, radiant temperature, humidity, draught and lighting, among other things, which add value to one's health and wellness. The layout of the Mahali houses was based on a traditional courtyard typology. "We might have to go back to this type of housing typically found in many African regions, from dwellings arranged around a central cattle enclosure or 'kraal', to the traditional Ashanti dwelling and Moroccan 'riad'.

"Orienting the courtyard around a central water feature adds the benefit of bioclimatic control and also increases the aesthetic qualities of the spaces linked to it," says Kadzere.

*Team Mahali house in Benguerir, Morocco, as part of a Green Building Urban Living Lab*

\* Mahali means 'Place' in Swahili. To follow Team Mahali's journeys and experimentation pathways to better 'Place' making, you are welcome to follow their social media pages @teammahali or visit their website at mahali.org.za.



# DIRECTORY

This publication showcases the COVID-19 research and research-related activities of selected individual researchers, research groups and entities at SU between March 2020 and June 2021. Previously published articles have been edited and the original sources are also indicated where appropriate. The directory includes the names and contact details of SU researchers who contributed to the articles in this publication, as well as links to the relevant affiliations mentioned in each.

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Dr Morné Mostert	mornem@ifr.sun.ac.za	Institute for Futures Research	<a href="http://www.ifr.sun.ac.za">www.ifr.sun.ac.za</a>
Prof Piet Naude	piet.naude@usb.ac.za	USB	<a href="http://www.usb.ac.za">www.usb.ac.za</a>
Dr Marina Joubert	marinajoubert@sun.ac.za	CREST	<a href="http://www0.sun.ac.za/crest">www0.sun.ac.za/crest</a>
Prof Nick Vink	nv@sun.ac.za	Department of Agricultural Economics	<a href="http://www.sun.ac.za/english/faculty/agri/agricultural-economics/home">www.sun.ac.za/english/faculty/agri/agricultural-economics/home</a>
Saartjie Botha	ssb@sun.ac.za	Toyota US Woordfees	<a href="http://www.woordfees.co.za/eng">www.woordfees.co.za/eng</a>
Ilhaam Groenewald	igroenewald@sun.ac.za	Maties Sport	<a href="http://www.sun.ac.za/english/sport">www.sun.ac.za/english/sport</a>
Prof Michael le Cordeur	mlecorde@sun.ac.za	Department of Curriculum Studies	<a href="http://www.sun.ac.za/english/faculty/education/curriculum-studies">www.sun.ac.za/english/faculty/education/curriculum-studies</a>
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Prof Susan Engelbrecht	susanen@sun.ac.za	Division of Medical Virology	<a href="http://www.sun.ac.za/english/faculty/healthsciences/virology">www.sun.ac.za/english/faculty/healthsciences/virology</a>
Bronwyn Kleinhans	l6478517@sun.ac.za	Faculty of Medicine and Health Sciences	<a href="http://www.sun.ac.za/english/faculty/healthsciences">www.sun.ac.za/english/faculty/healthsciences</a>
Kayla Delaney	l8426395@sun.ac.za	Faculty of Medicine and Health Sciences	<a href="http://www.sun.ac.za/english/faculty/healthsciences">www.sun.ac.za/english/faculty/healthsciences</a>
Prof Gert van Zyl	guvz@sun.ac.za	Division of Medical Virology	<a href="http://www.sun.ac.za/english/faculty/healthsciences/virology">www.sun.ac.za/english/faculty/healthsciences/virology</a>
Prof Wolfgang Preiser	preiser@sun.ac.za	Division of Medical Virology	<a href="http://www.sun.ac.za/english/faculty/healthsciences/virology">www.sun.ac.za/english/faculty/healthsciences/virology</a>
Prof Tulio de Oliveira	tulio@sun.ac.za	School for Data Science and Computational Thinking	<a href="http://www.sun.ac.za/english/data-science-and-computational-thinking">www.sun.ac.za/english/data-science-and-computational-thinking</a>
Dr Tongai Maponga	tongai@sun.ac.za	Division of Medical Virology	<a href="http://www.sun.ac.za/english/faculty/healthsciences/virology/Pages/Education0621-8497.aspx">www.sun.ac.za/english/faculty/healthsciences/virology/Pages/Education0621-8497.aspx</a>
Karabo Phadu	25095676@sun.ac.za	Division of Medical Virology	<a href="http://www.sun.ac.za/english/faculty/healthsciences/virology/Pages/Education0621-8497.aspx">www.sun.ac.za/english/faculty/healthsciences/virology/Pages/Education0621-8497.aspx</a>
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Prof Wesaal Khan	wesaal@sun.ac.za	Department of Microbiology	<a href="http://www.sun.ac.za/english/faculty/science/microbiology">www.sun.ac.za/english/faculty/science/microbiology</a>
Prof Wolfgang Preiser	preiser@sun.ac.za	Division of Medical Virology	<a href="http://www.sun.ac.za/english/faculty/healthsciences/virology/Pages/Staff0623-3397.aspx">www.sun.ac.za/english/faculty/healthsciences/virology/Pages/Staff0623-3397.aspx</a>
Prof Gideon Wolfaardt	gmw@sun.ac.za	Stellenbosch University Water Institute (SUWI)	<a href="http://www.sun.ac.za/english/entities/SUWI/Pages/default.aspx">www.sun.ac.za/english/entities/SUWI/Pages/default.aspx</a>
Dr Edward Archer	earcher@sun.ac.za	Stellenbosch University Water Institute (SUWI)	<a href="http://www.sun.ac.za/english/entities/SUWI/Pages/default.aspx">www.sun.ac.za/english/entities/SUWI/Pages/default.aspx</a>
Prof Barbara Kasprzyk-Hordern	B.Kasprzyk-Hordern@bath.ac.uk	University of Bath	<a href="http://www.bath.ac.uk">www.bath.ac.uk</a>
<b>SU immunology expertise employed in the battle against pandemic</b>			
Prof Dirk Bellstedt	dub@sun.ac.za	Department of Biochemistry	<a href="http://www.sun.ac.za/english/faculty/science/biochemistry">www.sun.ac.za/english/faculty/science/biochemistry</a>
Dr Angelique Smit	angeliques@sun.ac.za	Animal Facility	<a href="http://www.sun.ac.za/english/faculty/science/research/animal-facility">www.sun.ac.za/english/faculty/science/research/animal-facility</a>
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Prof Robert Mash	rm@sun.ac.za	Division of Family Medicine and Primary Care	<a href="http://www.sun.ac.za/english/faculty/healthsciences/department-of-family-and-emergency-medicine">www.sun.ac.za/english/faculty/healthsciences/department-of-family-and-emergency-medicine</a>
Dr Darcelle Schouw	dschouw@sun.ac.za	Division of Family Medicine and Primary Care	<a href="http://www.sun.ac.za/english/faculty/healthsciences/department-of-family-and-emergency-medicine">http://www.sun.ac.za/english/faculty/healthsciences/department-of-family-and-emergency-medicine</a>
Dr Emmanuelle Daviaud	edaviaud@mrc.ac.za	South African Medical Research Council	<a href="http://www.samrc.ac.za">www.samrc.ac.za</a>
Dr Donnela Besada	Donnela.Besada@mrc.ac.za	South African Medical Research Council	<a href="http://www.samrc.ac.za">www.samrc.ac.za</a>
Darrin Roman	Darrin.roman@westerncape.gov.za	Western Cape Government	<a href="http://www.westerncape.gov.za/your_gov/159/facilities">www.westerncape.gov.za/your_gov/159/facilities</a>





Researcher	Contact	Affiliation	Website
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Dr Tasnim Suliman	tasnims@sun.ac.za	University of the Western Cape Division of Medical Virology	<a href="http://www.uwc.ac.za">www.uwc.ac.za</a> <a href="http://www.sun.ac.za/english/faculty/healthsciences/virology">www.sun.ac.za/english/faculty/healthsciences/virology</a>
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Prof Peter Nyasulu	pniasulu@sun.ac.za	Division of Epidemiology and Biostatistics	<a href="http://www.sun.ac.za/english/faculty/healthsciences/epidemiology-biostatistics/masters/msc-biostatistics">www.sun.ac.za/english/faculty/healthsciences/epidemiology-biostatistics/masters/msc-biostatistics</a>
Prof Brian Allwood	brianallwood@sun.ac.za	Department of Medicine	<a href="http://www.sun.ac.za/english/faculty/healthsciences/medicine/contact-us">www.sun.ac.za/english/faculty/healthsciences/medicine/contact-us</a>
Prof Annalise Zemlin	azemlin@sun.ac.za	Department of Pathology	<a href="http://www.sun.ac.za/english/faculty/healthsciences/pathology">www.sun.ac.za/english/faculty/healthsciences/pathology</a>
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Prof Coenie Koegelenberg	coeniefn@sun.ac.za	Division of Pulmonology	<a href="http://www.sun.ac.za/english/faculty/healthsciences/medicine/divisions/pulmonology">www.sun.ac.za/english/faculty/healthsciences/medicine/divisions/pulmonology</a>
Dr Suretha Kannenberg	surethak@sun.ac.za	Division of Dermatology	<a href="http://www.sun.ac.za/english/faculty/healthsciences/medicine/dermatology">www.sun.ac.za/english/faculty/healthsciences/medicine/dermatology</a>
Prof Ian Vlok	ianvlok@sun.ac.za	Division of Neurosurgery	<a href="http://www.sun.ac.za/english/faculty/healthsciences/neurosurgery/Pages/Neurosurgery-.aspx">www.sun.ac.za/english/faculty/healthsciences/neurosurgery/Pages/Neurosurgery-.aspx</a>
Bronwyn Stockenstrom	info@sunskill.co.za	Sunskill Lab	<a href="https://sunskill.co.za/">https://sunskill.co.za/</a>
Dr Usha Lalla	usha@sun.ac.za	Department of Medicine	<a href="http://www.sun.ac.za/english/faculty/healthsciences/medicine/divisions/general-internal-medicine">www.sun.ac.za/english/faculty/healthsciences/medicine/divisions/general-internal-medicine</a>
Dr Kerry Louw	kerrylouw@sun.ac.za	Department of Psychiatry	<a href="http://www.sun.ac.za/english/faculty/healthsciences/psychiatry">www.sun.ac.za/english/faculty/healthsciences/psychiatry</a>
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Prof Rob Warren	rw1@sun.ac.za	Division of Molecular Biology and Human Genetics	<a href="http://www.sun.ac.za/english/faculty/healthsciences/Molecular_Biology_Human_Genetics">www.sun.ac.za/english/faculty/healthsciences/Molecular_Biology_Human_Genetics</a>
Prof Thomas Niesler	trn@sun.ac.za	Department of Electrical and Electronic Engineering	<a href="http://www.ee.sun.ac.za">www.ee.sun.ac.za</a>
Dr Marisa Kloppe	marisat@sun.ac.za	Division of Molecular Biology and Human Genetics	<a href="http://www.sun.ac.za/english/faculty/healthsciences/Molecular_Biology_Human_Genetics">www.sun.ac.za/english/faculty/healthsciences/Molecular_Biology_Human_Genetics</a>
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Dr Johan van der Merwe	jovdmerwe@sun.ac.za	Institute for Biomedical Engineering	<a href="http://www.ibe.sun.ac.za">www.ibe.sun.ac.za</a>
Cobus Zietsman	cjz@sun.ac.za	Department of Mechanical and Mechatronic Engineering	<a href="http://www.mecheng.sun.ac.za">www.mecheng.sun.ac.za</a>
Ferdie Zietsman	cfz@sun.ac.za	Department of Mechanical and Mechatronic Engineering	<a href="http://www.mecheng.sun.ac.za">www.mecheng.sun.ac.za</a>
Ockert Strydom	ockert@salt.ac.za	SARAO	<a href="http://www.sarao.ac.za/about/sarao">www.sarao.ac.za/about/sarao</a>
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Prof Johan Smith	js7@sun.ac.za	Department of Paediatrics and Child Health	<a href="http://www.sun.ac.za/english/faculty/healthsciences/paediatrics-and-child-health/Pages/Home.aspx">www.sun.ac.za/english/faculty/healthsciences/paediatrics-and-child-health/Pages/Home.aspx</a>
Prof Johan van Zyl	jmvzyl@sun.ac.za	Division of Clinical Pharmacology	<a href="http://www.sun.ac.za/english/faculty/healthsciences/Clinical%20Pharmacology/Pages/default.aspx">www.sun.ac.za/english/faculty/healthsciences/Clinical%20Pharmacology/Pages/default.aspx</a>
Prof Pieter van der Bijl	pieter.vanderbijl@gmail.com	Former Head, Department of Pharmacology	<a href="http://www.sun.ac.za/english/faculty/healthsciences/Clinical%20Pharmacology/Pages/default.aspx">www.sun.ac.za/english/faculty/healthsciences/Clinical%20Pharmacology/Pages/default.aspx</a>
Dr Mauritz Venter	info@azargen.com	AzarGen	<a href="http://azargen.com/">http://azargen.com/</a>
Dr Cobus Zwiegelaar	info@azargen.com	AzarGen	<a href="http://azargen.com/">http://azargen.com/</a>
Anita Nel	ajnel@sun.ac.za	Innovus	<a href="http://www.innovus.co.za">www.innovus.co.za</a>

Researcher	Contact	Affiliation	Website
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Prof Marlo Moller	marlom@sun.ac.za	Division of Molecular Biology and Human Genetics	<a href="http://www.sun.ac.za/english/faculty/healthsciences/Molecular_Biology_Human_Genetics">www.sun.ac.za/english/faculty/healthsciences/Molecular_Biology_Human_Genetics</a>
Dr Desiree Petersen	dp3@sun.ac.za	Department of Biomedical Sciences	<a href="http://www.sun.ac.za/english/faculty/healthsciences/biomedical_sciences">www.sun.ac.za/english/faculty/healthsciences/biomedical_sciences</a>
Prof Craig Kinnear	gkin@sun.ac.za	Department of Biomedical Sciences	<a href="http://www.sun.ac.za/english/faculty/healthsciences/biomedical_sciences">www.sun.ac.za/english/faculty/healthsciences/biomedical_sciences</a>
Dr Elouise Kroon	elouise_k@sun.ac.za	Division of Molecular Biology and Human Genetics	<a href="http://www.sun.ac.za/english/faculty/healthsciences/Molecular_Biology_Human_Genetics">www.sun.ac.za/english/faculty/healthsciences/Molecular_Biology_Human_Genetics</a>
Dr Brigitte Glanzmann	blindycycle@sun.ac.za	Faculty of Medicine and Health Sciences	<a href="http://www.sun.ac.za/english/faculty/healthsciences">www.sun.ac.za/english/faculty/healthsciences</a>
Dr Caitlin Uren	caitlinu@sun.ac.za	Faculty of Medicine and Health Sciences	<a href="http://www.sun.ac.za/english/faculty/healthsciences">www.sun.ac.za/english/faculty/healthsciences</a>
Prof Richard Glashoff	rglas@sun.ac.za	Division of Medical Microbiology	<a href="http://www.sun.ac.za/english/faculty/healthsciences/med_microbiology/Pages/Education0621-7701.aspx">www.sun.ac.za/english/faculty/healthsciences/med_microbiology/Pages/Education0621-7701.aspx</a>
Dr Helena Cornelissen	hcornelissen@sun.ac.za	Faculty of Medicine and Health Sciences	<a href="http://www.sun.ac.za/english/faculty/healthsciences">www.sun.ac.za/english/faculty/healthsciences</a>
Dr Zivanai Cuthbert Chapanduka	zivanai@sun.ac.za	Division of Haematological Pathology	<a href="http://www.sun.ac.za/english/faculty/healthsciences/haematological_pathology/Pages/Haematological-Pathology.aspx">www.sun.ac.za/english/faculty/healthsciences/haematological_pathology/Pages/Haematological-Pathology.aspx</a>
Dr Ibtisam Abdulla	ibtisam@sun.ac.za	Division of Haematological Pathology	<a href="http://www.sun.ac.za/english/faculty/healthsciences/haematological_pathology/Pages/Haematological-Pathology.aspx">www.sun.ac.za/english/faculty/healthsciences/haematological_pathology/Pages/Haematological-Pathology.aspx</a>
Clair Engelbrecht	clair@sun.ac.za	Division of Molecular Biology and Human Genetics	<a href="http://www.sun.ac.za/english/faculty/healthsciences/Molecular_Biology_Human_Genetics">www.sun.ac.za/english/faculty/healthsciences/Molecular_Biology_Human_Genetics</a>
Dr Shane Murray	cengen@cenegen.co.za	Centre for Proteomic and Genomic Research (CPGR)	<a href="http://www.cpgr.org.za">www.cpgr.org.za</a>
Helena Rabie	hrabie@sun.ac.za	Department of Paediatrics and Child Health	<a href="http://www.sun.ac.za/english/faculty/healthsciences/paediatrics-and-child-health/Pages/Home.aspx">www.sun.ac.za/english/faculty/healthsciences/paediatrics-and-child-health/Pages/Home.aspx</a>
Dr Deepthi Raju Abraham	deepthi@sun.ac.za	Faculty of Medicine and Health Sciences	<a href="http://www.sun.ac.za/english/faculty/healthsciences">www.sun.ac.za/english/faculty/healthsciences</a>
Dr Reinhard Hiller	reinhard.hiller@cpgr.org.za	Centre for Proteomic and Genomic Research (CPGR)	<a href="http://www.cpgr.org.za">www.cpgr.org.za</a>
Jeanne Korsman	jeanne.korsman@gmail.com	Centre for Proteomic and Genomic Research (CPGR)	<a href="http://www.cpgr.org.za">www.cpgr.org.za</a>
<b>Taking stock of comorbidities and coronavirus</b>			
Prof Taryn Young	tyoung@sun.ac.za	Division of Epidemiology and Biostatistics	<a href="http://www.sun.ac.za/english/faculty/healthsciences/epidemiology-biostatistics/masters/msc-biostatistics">www.sun.ac.za/english/faculty/healthsciences/epidemiology-biostatistics/masters/msc-biostatistics</a>
Anel Schoonees	anelschoonees@sun.ac.za	Division of Epidemiology and Biostatistics	<a href="http://www.sun.ac.za/english/faculty/healthsciences/epidemiology-biostatistics/masters/msc-biostatistics">www.sun.ac.za/english/faculty/healthsciences/epidemiology-biostatistics/masters/msc-biostatistics</a>
Dr Anthony Lachman	draslachman@gmail.com	University of Cape Town	<a href="http://www.uct.ac.za">www.uct.ac.za</a>
Dr Sebastiana Kalula	Sebastiana.kalula@uct.ac.za	University of Cape Town	<a href="http://www.uct.ac.za">www.uct.ac.za</a>
Dr Smart Mabwezara	smabwezara@gmail.com	University of Western Cape	<a href="http://www.uwc.ac.za">www.uwc.ac.za</a>
Dr Ezekiel Musa	MSXEZE001@myuct.ac.za	University of Cape Town	<a href="http://www.uct.ac.za">www.uct.ac.za</a>
Prof Naomi Levitt	Dinky.levitt@uct.ac.za	University of Cape Town	<a href="http://www.uct.ac.za">www.uct.ac.za</a>
<b>Researchers unravel effects of COVID-19 on blood clotting</b>			
Prof Resia Pretorius	resiap@sun.ac.za	Department of Physiological Sciences	<a href="http://www.sun.ac.za/english/faculty/science/physiologicalsciences">www.sun.ac.za/english/faculty/science/physiologicalsciences</a>
Dr Chantelle Venter	chantellev@sun.ac.za	Department of Physiological Sciences	<a href="http://www.sun.ac.za/english/faculty/science/physiologicalsciences">www.sun.ac.za/english/faculty/science/physiologicalsciences</a>
Jandré Bezuidenhout	jabez@sun.ac.za	Department of Physiological Sciences	<a href="http://www.sun.ac.za/english/faculty/science/physiologicalsciences">www.sun.ac.za/english/faculty/science/physiologicalsciences</a>
Corlia Grobler	21069921@sun.ac.za	Department of Physiological Sciences	<a href="http://www.sun.ac.za/english/faculty/science/physiologicalsciences">www.sun.ac.za/english/faculty/science/physiologicalsciences</a>
Siphosethu Maphumulo	20825919@sun.ac.za	Department of Physiological Sciences	<a href="http://www.sun.ac.za/english/faculty/science/physiologicalsciences">www.sun.ac.za/english/faculty/science/physiologicalsciences</a>

Researcher	Contact	Affiliation	Website
Meirelle Grobelaar	21074682@sun.ac.za	Department of Physiological Sciences	<a href="http://www.sun.ac.za/english/faculty/science/physiologicalsciences">www.sun.ac.za/english/faculty/science/physiologicalsciences</a>
Jhade Bredenkamp	20006721@sun.ac.za	Department of Physiological Sciences	<a href="http://www.sun.ac.za/english/faculty/science/physiologicalsciences">www.sun.ac.za/english/faculty/science/physiologicalsciences</a>
Dr Jaco Laubscher	laubscher911@gmail.com	Mediclinic	<a href="http://www.mediclinic.co.za/en/corporate/home.html">www.mediclinic.co.za/en/corporate/home.html</a>
Dr Johan Lourens	sb.narkose@medinet.co.za	Mediclinic	<a href="http://www.mediclinic.co.za/en/corporate/home.html">www.mediclinic.co.za/en/corporate/home.html</a>
Dr Janami Steenkamp	janami@pathcare.org	Pathcare	<a href="http://www.pathcare.co.za/pathologists/dr-janami-steenkamp">www.pathcare.co.za/pathologists/dr-janami-steenkamp</a>
<b>Research at district hospitals provides new insights</b>			
Prof Bob Mash	rm@sun.ac.za	Division of Family Medicine and Primary Care	<a href="http://www.sun.ac.za/english/faculty/healthsciences/Family%20Medicine%20and%20Primary%20Care/Pages/Family-Medicine-and-Primary-Care.aspx">www.sun.ac.za/english/faculty/healthsciences/Family%20Medicine%20and%20Primary%20Care/Pages/Family-Medicine-and-Primary-Care.aspx</a>
Dr Mellisa Presence-Vollenhoven and members of the Stellenbosch University Family Physician Research Network	mellisasmail@gmail.com	Family Physician Research Network	
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Kelsey Lemon	23426594@sun.ac.za	Department of History	<a href="http://www.sun.ac.za/english/faculty/arts/history">www.sun.ac.za/english/faculty/arts/history</a>
Jonathan Jayes	24458392@sun.ac.za	Department of Economics	<a href="http://www.ekon.sun.ac.za">www.ekon.sun.ac.za</a>
Dr Elie Murard	23607319@sun.ac.za	Department of Economics	<a href="http://www.ekon.sun.ac.za">www.ekon.sun.ac.za</a>
Dr Young-ook Jang	Former post-doc	Department of Economics	<a href="http://www.ekon.sun.ac.za">www.ekon.sun.ac.za</a>
Dr Kate Ekama	kateekama@sun.ac.za	Department of History	<a href="http://www.sun.ac.za/english/faculty/arts/history">www.sun.ac.za/english/faculty/arts/history</a>
Prof Johan Fourie	johanf@sun.ac.za	Department of Economics	<a href="http://www.ekon.sun.ac.za">www.ekon.sun.ac.za</a>
Dr Kara Dimitruk	karadimitruk@sun.ac.za	Department of Economics	<a href="http://www.ekon.sun.ac.za">www.ekon.sun.ac.za</a>
<b>Study tracks pandemic's effects on children</b>			
Dr Andrew Redfern	redfern@sun.ac.za	Department of Paediatrics and Child Health	<a href="http://www.sun.ac.za/english/faculty/healthsciences/paediatrics-and-child-health/Pages/Home.aspx">www.sun.ac.za/english/faculty/healthsciences/paediatrics-and-child-health/Pages/Home.aspx</a>
Prof Helena Rabie	hrabie@sun.ac.za	Department of Paediatrics and Child Health	<a href="http://www.sun.ac.za/english/faculty/healthsciences/paediatrics-and-child-health/Pages/Home.aspx">www.sun.ac.za/english/faculty/healthsciences/paediatrics-and-child-health/Pages/Home.aspx</a>
Dr Marieke van der Zalm	mariekevdzalm@sun.ac.za	Department of Paediatrics and Child Health	<a href="http://www.sun.ac.za/english/faculty/healthsciences/paediatrics-and-child-health/Pages/Home.aspx">www.sun.ac.za/english/faculty/healthsciences/paediatrics-and-child-health/Pages/Home.aspx</a>
<b>Sport and exercise medicine during pandemics</b>			
Prof Wayne Derman	ewderman@sun.ac.za	Institute of Sport and Exercise Medicine (ISEM)	<a href="http://www.isemsun.com">www.isemsun.com</a>
Dr Pierre Viviers	pliviers@sun.ac.za	Campus Health Service	<a href="http://www.sun.ac.za/english/CampusHealth">www.sun.ac.za/english/CampusHealth</a>
<b>COVID-19 vaccines, food security and learning losses highlighted in survey study</b>			
Dr Nic Spaul	spaul@sun.ac.za	ReSEP (Research on Socio-economic Policy) in the Department of Economics	<a href="https://resep.sun.ac.za">https://resep.sun.ac.za</a>
<b>Electron microscopy contributes to local production of protective gear – Dr Jurgen Kriel</b> <a href="http://www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=7637">www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=7637</a>			
Dr Jurgen Kriel	jkriel@sun.ac.za	Central Analytical Facilities (CAF)	<a href="http://www.sun.ac.za/english/faculty/science/CAF">www.sun.ac.za/english/faculty/science/CAF</a>
Dr Megan Coates	megancoates@sun.ac.za	Stellenbosch Nanofiber Company (SNC)	<a href="https://sncfibers.com">https://sncfibers.com</a>
<b>SU scientist develops test for face mask fabric efficacy – Media &amp; Communication, Faculty of Science</b> <a href="http://www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=7331#:~:text=Adine%20Gericke%2C%20a%20textile%20specialist,used%20in%20fabric%20face%20masks.">www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=7331#:~:text=Adine%20Gericke%2C%20a%20textile%20specialist,used%20in%20fabric%20face%20masks.</a>			
Adine Gericke	agericke@sun.ac.za	Department of Chemistry and Polymer Science	<a href="http://www0.sun.ac.za/chemistry">www0.sun.ac.za/chemistry</a>



Researcher	Contact	Affiliation	Website
<b>Maties 3D print protective gear for fight against coronavirus – Sue Segar</b> <a href="http://www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=7261">www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=7261</a>			
Dr Rudolph Venter	rgventer@sun.ac.za	Division of Clinical Anatomy	<a href="http://www.sun.ac.za/english/faculty/healthsciences/Clinical_Anatomy/Pages/Contact-us0522-9709.aspx">www.sun.ac.za/english/faculty/healthsciences/Clinical_Anatomy/Pages/Contact-us0522-9709.aspx</a>
Prof Jacques du Toit	jdtt@sun.ac.za	Division of Orthopaedic Surgery	<a href="http://www.sun.ac.za/english/faculty/healthsciences/orthopaedics/Pages/Orthopaedics.aspx">www.sun.ac.za/english/faculty/healthsciences/orthopaedics/Pages/Orthopaedics.aspx</a>
Prof Kristiaan Schreve	kschreve@sun.ac.za	Department of Mechanical and Mechatronic Engineering	<a href="http://www.mecheng.sun.ac.za">www.mecheng.sun.ac.za</a>
Kevin Neaves	kneaves@sun.ac.za	Department of Mechanical and Mechatronic Engineering	<a href="http://www.mecheng.sun.ac.za">www.mecheng.sun.ac.za</a>
Luné Smith	19937067@sun.ac.za	Faculty of Medicine and Health Sciences	<a href="http://www.sun.ac.za/english/faculty/healthsciences">www.sun.ac.za/english/faculty/healthsciences</a>
Abdul-Mutakabit Aziz	20878273@sun.ac.za	Faculty of Medicine and Health Sciences	<a href="http://www.sun.ac.za/english/faculty/healthsciences">www.sun.ac.za/english/faculty/healthsciences</a>
<b>Finding the best treatment for COVID-19 patients</b>			
Dr Michael McCaul	mmccaul@sun.ac.za	Division of Epidemiology and Biostatistics	<a href="http://www.sun.ac.za/english/faculty/healthsciences/epidemiology-biostatistics/Pages/default.aspx">www.sun.ac.za/english/faculty/healthsciences/epidemiology-biostatistics/Pages/default.aspx</a>
Dr Amanda Brand	asbrand@sun.ac.za	Division of Epidemiology and Biostatistics	<a href="http://www.sun.ac.za/english/faculty/healthsciences/epidemiology-biostatistics/Pages/default.aspx">www.sun.ac.za/english/faculty/healthsciences/epidemiology-biostatistics/Pages/default.aspx</a>
Ameer Hohlfeld	ahohlfeld@sun.ac.za	Division of Epidemiology and Biostatistics	<a href="http://www.sun.ac.za/english/faculty/healthsciences/epidemiology-biostatistics/Pages/default.aspx">www.sun.ac.za/english/faculty/healthsciences/epidemiology-biostatistics/Pages/default.aspx</a>
Dr Olatunji Adetokunboh	olatunji@sun.ac.za	DSI-NRF Centre of Excellence in Epidemiological Modelling and Analysis (SACEMA)	<a href="http://www.sacema.org">www.sacema.org</a>
<b>SU researchers turn bread into hand sanitiser – Engela Duvenage</b> <a href="http://www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=7239">www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=7239</a>			
Dr Stefan Hayward	stefanh@sun.ac.za	Department of Food Science	<a href="http://www.sun.ac.za/english/faculty/agri/food-science">www.sun.ac.za/english/faculty/agri/food-science</a>
Dr Timo Tait	ttait@sun.ac.za	Department of Food Science	<a href="http://www.sun.ac.za/english/faculty/agri/food-science">www.sun.ac.za/english/faculty/agri/food-science</a>
Sebastian Orth	sorth@sun.ac.za	Department of Food Science	<a href="http://www.sun.ac.za/english/faculty/agri/food-science">www.sun.ac.za/english/faculty/agri/food-science</a>
<b>SOCIO-ECONOMIC IMPACTS OF THE PANDEMIC</b>			<b>Page 50</b>
<b>Compassion and guilt as drivers of structural reform during the pandemic</b>			
Prof Melike Fourie	melikef@sun.ac.za	Chair for Historical Trauma and Transformation	<a href="http://www.sun.ac.za/english/faculty/arts/historical-trauma-transformation/overview">www.sun.ac.za/english/faculty/arts/historical-trauma-transformation/overview</a>
Dr Wilhelm J. Verwoerd	wilhelmv@sun.ac.za	Chair for Historical Trauma and Transformation	<a href="http://www.sun.ac.za/english/faculty/arts/historical-trauma-transformation/overview">www.sun.ac.za/english/faculty/arts/historical-trauma-transformation/overview</a>
<b>Tax relief strategies for recovery</b> <a href="https://theconversation.com/covid-19-tax-relief-a-snapshot-of-whats-out-there-135373">https://theconversation.com/covid-19-tax-relief-a-snapshot-of-whats-out-there-135373</a>			
Dr Lee-Ann Steenkamp	lee-ann.steenkamp@usb.ac.za	USB	<a href="http://www.usb.ac.za">www.usb.ac.za</a>
<b>Rehabilitation in the time of coronavirus</b>			
Prof Lana van Niekerk	lanavn@sun.ac.za	Division of Occupational Therapy	<a href="http://www.sun.ac.za/english/faculty/healthsciences/Occupational%20Therapy/Pages/Occupational-Therapy.aspx">www.sun.ac.za/english/faculty/healthsciences/Occupational%20Therapy/Pages/Occupational-Therapy.aspx</a>
Dr Hester van Biljon	22434291@sun.ac.za	Faculty of Medicine and Health Sciences	<a href="http://www.sun.ac.za/english/faculty/healthsciences">www.sun.ac.za/english/faculty/healthsciences</a>
<b>Data or bread? Student experiences of learning under lockdown</b> <a href="https://journals.co.za/doi/10.10520/ejc-sare-v26-n1-a11">https://journals.co.za/doi/10.10520/ejc-sare-v26-n1-a11</a>			
Prof Jonathan Jansen	jonathanjansen@sun.ac.za	Department of Education Policy Studies	<a href="http://www.sun.ac.za/english/faculty/education/education-policy-studies">www.sun.ac.za/english/faculty/education/education-policy-studies</a>
<b>The neoliberal impact on social work and why it matters</b> <a href="https://socialwork.journals.ac.za/pub/article/view/854">https://socialwork.journals.ac.za/pub/article/view/854</a>			
Prof Lambert K. Engelbrecht	lke@sun.ac.za	Department of Social Work	<a href="http://www.sun.ac.za/english/faculty/arts/social-work">www.sun.ac.za/english/faculty/arts/social-work</a>
Dr Abigail Ornellas	15851672@sun.ac.za	Department of Social Work	<a href="http://www.sun.ac.za/english/faculty/arts/social-work">www.sun.ac.za/english/faculty/arts/social-work</a>
Elvan Atamturk	elvan.atamturk@kocaeli.edu.tr	Kocaeli University	<a href="http://www.kocaeli.edu.tr/int">www.kocaeli.edu.tr/int</a>



Researcher	Contact	Affiliation	Website
<b>COVID-19 and problematic use of the internet</b>			
Prof Christine Lochner	cl2@sun.ac.za	Department of Psychiatry	<a href="http://www.sun.ac.za/english/faculty/healthsciences/psychiatry">www.sun.ac.za/english/faculty/healthsciences/psychiatry</a>
Prof Dan J. Stein	djs2@sun.ac.za	Department of Psychiatry	<a href="http://www.sun.ac.za/english/faculty/healthsciences/psychiatry">www.sun.ac.za/english/faculty/healthsciences/psychiatry</a>
Clara Marincowitz	claram@sun.ac.za	Department of Psychiatry	<a href="http://www.sun.ac.za/english/faculty/healthsciences/psychiatry">www.sun.ac.za/english/faculty/healthsciences/psychiatry</a>
Charlene Omrawo	comrawo@sun.ac.za	Department of Psychiatry	<a href="http://www.sun.ac.za/english/faculty/healthsciences/psychiatry">www.sun.ac.za/english/faculty/healthsciences/psychiatry</a>
Gizela van den Berg	19046073@sun.ac.za	Faculty of Economic and Management Sciences	<a href="http://www.sun.ac.za/english/faculty/economy">www.sun.ac.za/english/faculty/economy</a>
<b>Using technology to provide psychological support during the pandemic</b>			
Prof Jason Bantjes	jbantjes@sun.ac.za	Institute for Life Course Health Research	<a href="http://www.lifecoursehealthresearch.org/">www.lifecoursehealthresearch.org/</a>
<b>Property and Pandemics: A property law perspective</b>			
Dr Elsabé van der Sijde	elsabevds@sun.ac.za	South African Research Chair in Property Law (SARCPL)	<a href="https://blogs.sun.ac.za/law">https://blogs.sun.ac.za/law</a>
Prof Zsa-Zsa Boggenpoel	zsazsa@sun.ac.za	South African Research Chair in Property Law (SARCPL)	<a href="https://blogs.sun.ac.za/law">https://blogs.sun.ac.za/law</a>
Dr Mpho Tlale	mphotlale@sun.ac.za	South African Research Chair in Property Law (SARCPL)	<a href="https://blogs.sun.ac.za/law">https://blogs.sun.ac.za/law</a>
Sameera Mahomed	sameeram@sun.ac.za	South African Research Chair in Property Law (SARCPL)	<a href="https://blogs.sun.ac.za/law">https://blogs.sun.ac.za/law</a>
<b>Study considers the role of nurses during COVID-19 – Jackie Pienaar-Brink</b> <a href="http://www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=7672">www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=7672</a>			
Dr Talitha Crowley	tcrowley@sun.ac.za	Department of Nursing and Midwifery	<a href="http://www.sun.ac.za/english/faculty/healthsciences/Nursing/Pages/Staff0604-3234.aspx">www.sun.ac.za/english/faculty/healthsciences/Nursing/Pages/Staff0604-3234.aspx</a>
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Prof Ashraf Kagee	skagee@sun.ac.za	Department of Psychology	<a href="http://www.sun.ac.za/english/faculty/arts/psychology">www.sun.ac.za/english/faculty/arts/psychology</a>
Dr Bronwyné Jo'sean Coetzee	bronwyne@sun.ac.za	Department of Psychology	<a href="http://www.sun.ac.za/english/faculty/arts/psychology">www.sun.ac.za/english/faculty/arts/psychology</a>
<b>COVID-19's impact on mental health</b> <a href="http://www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=7309">www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=7309</a>			
Prof Soraya Seedat	sseedat@sun.ac.za	Department of Psychiatry	<a href="http://www.sun.ac.za/english/faculty/healthsciences/psychiatry">www.sun.ac.za/english/faculty/healthsciences/psychiatry</a>
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Dr Judy-Ann Cilliers	15805816@sun.ac.za	Department of Philosophy	<a href="http://www0.sun.ac.za/philosophy">www0.sun.ac.za/philosophy</a>
<b>COVID Diaries is 'an archive of women's voices' amid the pandemic</b>			
Prof Amanda Gouws	ag1@sun.ac.za	SARChI Chair in Gender Politics, Department of Political Science	<a href="http://www0.sun.ac.za/politicalscience/sarchi">www0.sun.ac.za/politicalscience/sarchi</a>
Olivia Ezeobi	olivia@sun.ac.za	Department of Economics	<a href="http://www.ekon.sun.ac.za">www.ekon.sun.ac.za</a>
<b>Study probes COVID-19 impact on women academics – Daniel Bugan</b> <a href="http://www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=7711">www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=7711</a>			
Prof Jonathan Jansen	jonathanjansen@sun.ac.za	Department of Education Policy Studies	<a href="http://www.sun.ac.za/english/faculty/education/education-policy-studies">www.sun.ac.za/english/faculty/education/education-policy-studies</a>
<b>Disability considerations amidst a pandemic</b>			
Dr Lieketseng Ned	Lieketseng@sun.ac.za	Centre for Disability & Rehabilitation Studies	<a href="http://www.sun.ac.za/english/faculty/healthsciences/Centre%20for%20Rehabilitation%20Studies/Pages/Centre-for-Rehabilitation-Studies.aspx">www.sun.ac.za/english/faculty/healthsciences/Centre%20for%20Rehabilitation%20Studies/Pages/Centre-for-Rehabilitation-Studies.aspx</a>
Dr Emma Louise McKinney	emma@disabilityincluded.co.za	University of the Western Cape	<a href="http://www.uwc.ac.za">www.uwc.ac.za</a>
Dr Vic McKinney	victor.mckinney@uct.ac.za	University of Cape Town	<a href="http://www.uct.ac.za">www.uct.ac.za</a>
Prof Leslie Swartz	lswartz@sun.ac.za	Department of Psychology	<a href="http://www.sun.ac.za/english/faculty/arts/psychology">www.sun.ac.za/english/faculty/arts/psychology</a>



Researcher	Contact	Affiliation	Website
<b>Project makes COVID-19 information accessible to the deaf community – Daniel Bugan</b> <a href="http://www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=8079">www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=8079</a>			
Prof Frenette Southwood	<a href="mailto:fs@sun.ac.za">fs@sun.ac.za</a>	Department of General Linguistic	<a href="http://www.sun.ac.za/english/faculty/arts/linguistics">www.sun.ac.za/english/faculty/arts/linguistics</a>
Vanessa Reyneke	<a href="mailto:vanessa2@sun.ac.za">vanessa2@sun.ac.za</a>	Department of General Linguistics	<a href="http://www.sun.ac.za/english/faculty/arts/linguistics">www.sun.ac.za/english/faculty/arts/linguistics</a>
Stephanie Lotz	<a href="mailto:lotz.steph@gmail.com">lotz.steph@gmail.com</a>	DEAF Community	

## CREATIVITY AMIDST CRISIS

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### Music-improvising practices amidst social distancing and lockdown

Prof Stephanus Muller	<a href="mailto:smuller@sun.ac.za">smuller@sun.ac.za</a>	Department of Music	<a href="http://www0.sun.ac.za/music">www0.sun.ac.za/music</a>
Dr Esther Marié Pauw	<a href="mailto:empauw@sun.ac.za">empauw@sun.ac.za</a>	Africa Open Institute for Music, Research and Innovation (AOI)	<a href="https://aoiinstitute.ac.za">https://aoiinstitute.ac.za</a>
Garth Erasmus	<a href="mailto:erasmusg@sun.ac.za">erasmusg@sun.ac.za</a>	Africa Open Institute for Music, Research and Innovation (AOI)	<a href="https://aoiinstitute.ac.za">https://aoiinstitute.ac.za</a>
Pierre-Henri Wicomb	<a href="mailto:phwicomb@sun.ac.za">phwicomb@sun.ac.za</a>	Africa Open Institute for Music, Research and Innovation (AOI)	<a href="https://aoiinstitute.ac.za">https://aoiinstitute.ac.za</a>
Dr Visser Liebenberg	<a href="mailto:l7449413@sun.ac.za">l7449413@sun.ac.za</a>	Department of Music	<a href="http://www0.sun.ac.za/music">www0.sun.ac.za/music</a>
Dr Stephanie Vos	<a href="mailto:svos@sun.ac.za">svos@sun.ac.za</a>	Africa Open Institute for Music, Research and Innovation (AOI)	<a href="https://aoiinstitute.ac.za">https://aoiinstitute.ac.za</a>
Dr Carina Venter	<a href="mailto:cvent@sun.ac.za">cvent@sun.ac.za</a>	Department of Music	<a href="http://www0.sun.ac.za/music">www0.sun.ac.za/music</a>
Dr Cara Stacy	<a href="mailto:cara.stacey@nwu.ac.za">cara.stacey@nwu.ac.za</a>	North West University	<a href="http://www.nwu.ac.za">www.nwu.ac.za</a>
Jill Richards	<a href="mailto:jillyrichards@gmail.com">jillyrichards@gmail.com</a>		<a href="http://www.jillrichards.com/index.html">www.jillrichards.com/index.html</a>

### Spiky blobs with evil grins: Coronavirus visualisations in newspaper cartoons

Dr Marina Joubert	<a href="mailto:marinajoubert@sun.ac.za">marinajoubert@sun.ac.za</a>	CREST	<a href="http://www0.sun.ac.za/crest">www0.sun.ac.za/crest</a>
Prof Herman Wasserman	<a href="mailto:herman.wasserman@uct.ac.za">herman.wasserman@uct.ac.za</a>	University of Cape Town	<a href="http://www.cfms.uct.ac.za">www.cfms.uct.ac.za</a>

## (NOT) BUSINESS AS USUAL

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### Leading amidst a pandemic

[www.usb.ac.za/usb\\_news/not-all-leaders-are-equally-well-during-covid-19](http://www.usb.ac.za/usb_news/not-all-leaders-are-equally-well-during-covid-19)

Dr Nicky Terblanche	<a href="mailto:nicky@usb.ac.za">nicky@usb.ac.za</a>	USB	<a href="http://www.usb.ac.za">www.usb.ac.za</a>
<b>Pandemic forces business leaders to ask new questions – Development &amp; Alumni</b> <a href="http://www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=7327">www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=7327</a>			
Dr Morné Mostert	<a href="mailto:mornem@ifr.sun.ac.za">mornem@ifr.sun.ac.za</a>	Institute for Futures Research	<a href="http://www.ifr.sun.ac.za">www.ifr.sun.ac.za</a>

## BUILDING RESILIENCE, FINDING SOLUTIONS

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### Innovative oxygen treatment saves lives and healthcare resources – Wilma Stassen

[www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=7734](http://www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=7734)

Dr Usha Lalla	<a href="mailto:usha@sun.ac.za">usha@sun.ac.za</a>	Division of General Internal Medicine	<a href="http://www.sun.ac.za/english/faculty/healthsciences/medicine/divisions/general-internal-medicine">www.sun.ac.za/english/faculty/healthsciences/medicine/divisions/general-internal-medicine</a>
Prof Coenie Koegelenberg	<a href="mailto:coeniefn@sun.ac.za">coeniefn@sun.ac.za</a>	Division of Pulmonology	<a href="http://www.sun.ac.za/english/faculty/healthsciences/medicine/divisions/pulmonology">www.sun.ac.za/english/faculty/healthsciences/medicine/divisions/pulmonology</a>
Prof Greg Calligaro	<a href="mailto:greg.calligaro@uct.ac.za">greg.calligaro@uct.ac.za</a>	UCT	<a href="http://www.uct.ac.za">www.uct.ac.za</a>

### COVID-19: a dilemma for conservation in Africa

<https://theconversation.com/covid-19-africas-conservation-and-trophy-hunting-dilemma-140029>

Dr Duan Biggs	<a href="mailto:d.biggs@griffith.edu.au">d.biggs@griffith.edu.au</a>	Griffith University	<a href="http://www.griffith.edu.au">www.griffith.edu.au</a>
Dr Alexander Braczowski	<a href="mailto:alexander.braczowski@gmail.com">alexander.braczowski@gmail.com</a>	Griffith University	<a href="http://www.griffith.edu.au">www.griffith.edu.au</a>
Dr Alta de Vos	<a href="mailto:a.devos@ru.ac.za">a.devos@ru.ac.za</a>	Rhodes University	<a href="http://www.ru.ac.za">www.ru.ac.za</a>
Dr Hayley Clements	<a href="mailto:hayleyclements@sun.ac.za">hayleyclements@sun.ac.za</a>	Centre for Complex Systems in Transition	<a href="http://www0.sun.ac.za/cst">www0.sun.ac.za/cst</a>
Kim Parker	<a href="mailto:kimhparker5@gmail.com">kimhparker5@gmail.com</a>	Rhodes University	<a href="http://www.ru.ac.za">www.ru.ac.za</a>

### Disaster risk resilience network steps up to help Africa – SU International

[www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=7372](http://www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=7372)

Alberto Francioli	<a href="mailto:albertofrancioli@sun.ac.za">albertofrancioli@sun.ac.za</a>	Centre for Collaboration in Africa	<a href="http://www.riskreductionafrica.org">www.riskreductionafrica.org</a>
-------------------	--	------------------------------------	--

Researcher	Contact	Affiliation	Website
<b>Peptide-derived materials to curb pathogen transfer</b>			
Prof Marina Rautenbach	mra@sun.ac.za	Department of Biochemistry	www.sun.ac.za/english/faculty/science/biochemistry
Dr Wilma van Rensburg	15088421@sun.ac.za	Department of Biochemistry	www.sun.ac.za/english/faculty/science/biochemistry
<b>SU researchers reimagine housing with a return to the 'kraal' – Corporate Communication &amp; Marketing</b>			
<a href="https://www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=8027">https://www.sun.ac.za/english/Lists/news/DispForm.aspx?ID=8027</a>			
Sharné Bloem	sbloem@sun.ac.za	Centre for Complex Systems in Transition	www0.sun.ac.za/cst
Wimbayi Kadzere	info@mahali.org.za	Mahali	www.mahali.org.za



SU researchers also actively participated in COVID-19-related editorials and opinion pieces. A report with more than 50 of these contributions has been compiled by the Division for Research Development. It covers a selection of contributions between March 2020 to February 2021.

<https://bit.ly/SUeditorials>

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## FACULTIES

### Faculty of AgriSciences

Prof Danie Brink – Dean  
db@sun.ac.za  
<https://agric.sun.ac.za>

### Faculty of Arts and Social Sciences

Prof Anthony Leysens – Dean  
ajl2@sun.ac.za  
[www.sun.ac.za/arts](http://www.sun.ac.za/arts)

### Faculty of Economic and Management Sciences

Prof Ingrid Woolard – Dean  
lesinda@sun.ac.za  
[www.sun.ac.za/ems](http://www.sun.ac.za/ems)

### Faculty of Education

Prof Mbulungeni Madiba – Dean  
madiba@sun.ac.za  
[www.sun.ac.za/education](http://www.sun.ac.za/education)

### Faculty of Engineering

Prof Wikus van Niekerk – Dean  
engdean@sun.ac.za  
[www.eng.sun.ac.za](http://www.eng.sun.ac.za)

### Faculty of Law

Prof Nicola Smit – Dean  
nsmit@sun.ac.za  
[www.sun.ac.za/law](http://www.sun.ac.za/law)

### Faculty of Medicine and Health Sciences

Prof Jimmy Volmink – Dean  
deanfhs@sun.ac.za  
[www.sun.ac.za/health](http://www.sun.ac.za/health)

### Faculty of Military Science

Prof Samuel Tshehla – Dean  
samuel@ma2.sun.ac.za  
[www.sun.ac.za/english/faculty/milscience](http://www.sun.ac.za/english/faculty/milscience)

### Faculty of Science

Prof Louise Warnich – Dean  
lw@sun.ac.za  
[www.sun.ac.za/science](http://www.sun.ac.za/science)

### Faculty of Theology

Prof Reggie Nel – Dean  
rwnel@sun.ac.za  
[www.sun.ac.za/theology](http://www.sun.ac.za/theology)

## CONTACT US

### Division for Research Development

Research Information and Strategy Cluster  
Stellenbosch University  
Private Bag XI, Matieland 7602  
Tel: +27 (0)21 808 4623  
mh3@sun.ac.za

### Library and Information Service

Stellenbosch University  
Private Bag X5036  
Tel: +27 (0)21 808 4876  
shuleneh@sun.ac.za

### Postgraduate Office

Stellenbosch University  
Private Bag XI, Matieland 7602  
Tel: +27 (0)21 808 9436  
Fax: +27 (0)21 883 9027  
postgraduate@sun.ac.za

### Information Technology

Stellenbosch University  
Private Bag XI, Matieland 7602  
Tel: +27 (0)21 808 4140  
helpinfo@sun.ac.za

### Stellenbosch University International

Stellenbosch University  
Private Bag XI, Matieland  
Stellenbosch, 7600  
Tel: +27 (0)21 808 9266  
Fax: +27 (0)21 808 4460  
interoffice@sun.ac.za

### Development and Alumni Relations

Stellenbosch University  
Private Bag XI, Matieland 7602  
Stellenbosch, 7600  
Tel: +27 (0)21 808 9266  
Fax: +27 (0)21 808 8405  
dar\_research@sun.ac.za

### Corporate Marketing

Stellenbosch University  
Private Bag XI Matieland 7602  
Tel: +27 (0)21 808 4921  
viljoenm@sun.ac.za

## ACKNOWLEDGEMENTS

**Editorial team:** Maryke Hunter-Hüsselmann, Jorisna Bonthuys, Anneke Potgieter, Whitney Prins, Jennifer de Beer, Aasima Gaffoor

**Design and layout:** Jenny Frost Design

**Photography:** Waldemar Brandt / Unsplash; Centers for Disease Control and Prevention (CDC) / Unsplash; Pawel Czerwinski / Unsplash; Diabetesmagazijn.nl / Unsplash; Charles Deluvio / Unsplash; Eskemar / iStock; Chloe Evans / Unsplash; Halacious / Unsplash; Jo Hilton / Unsplash; Brett Jordan / Unsplash; Anton Jordaan / SSFD; Kobu Agency / Unsplash; Mika Korhonen / Unsplash; Greg Rosenke / Unsplash; Elena mozhvilo / Unsplash; Damien Schumann; Yulissa Tagle / Unsplash; Team Mahali; Visuals / Unsplash; Vitezslav Vylicil / iStock; Markus Winkler / Unsplash

**Collaborators:** The editorial team would like to thank the staff members in each SU faculty who are responsible for media liaison; staff at the Corporate Communications Division at the main campus, FMHS Marketing and Communications Division, as well as all our researchers and other staff members who collaborated on this publication by providing us with stories or photographs.

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