CERI & KRISP Newsletter

Volume 5, Number 10, October/November 2022

Introduction

Welcome to another edition of the CERI & KRISP Newsletter. This month we reflect on how much recognition we have received nationally and internationally and also reflect about what can be done better and how best to prepare for future threats to global health.

This past month saw the publication of a landmark paper in Science, showcasing the capabilities of African scientists as a collective; members of our team travelling abroad to participate and teach in an international bioinformatics in Senegal and attending the World Health Summit in Berlin.

The importance of driving and encouraging these collaborations to find shared solutions to these collective health challenges and the upskilling of scientists in the global south to a level where they can take the lead, cannot be underestimated.

Highlights

News: **Prof. Tulio de Oliveira meets a hero, Barack Obama, at the Illumina Genomics Forum, San Diego.**

Feature: **The evolving SARS-CoV-2 epidemic in Africa: Insights from rapidly expanding genomic surveillance, Science publication**.

News: **100,000 coronavirus genomes reveal COVID's evolution in Africa.**

Feature: **An Advocate for Africa, Science and Pulitzer Centre.**

Award: **German-Africa Prize won by Scientists who identified Omicron.**

Symposium: **First Nobel in Africa, 24-28 Oct 2022.**

Workshop: **Senegal Bioinformatics Workshop, Dakar, 3-15 October 2022.**

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PROFILE: Prof. Tulio de Oliveira is an invited speaker at the Illumina Genomics Forum, San Diego, 28 Sept to 1 Oct 2022

Reflections of the historical event at Illumina Genomics Forum. Here, I highlight that it is not the technology & economics of scale that matter, but if we DO NOT use it to make a better, fairer and safer world, we will waste a lifetime opportunity.

One highlight of the forum was meeting Barack Obama and Dr. Sonia Vallabh. Both have worked against major adversity to develop health solutions. Dr Vallabh is a scientist working on rapid dementia, a genetic disease that killed her mother, and she is also at risk of developing dementia.

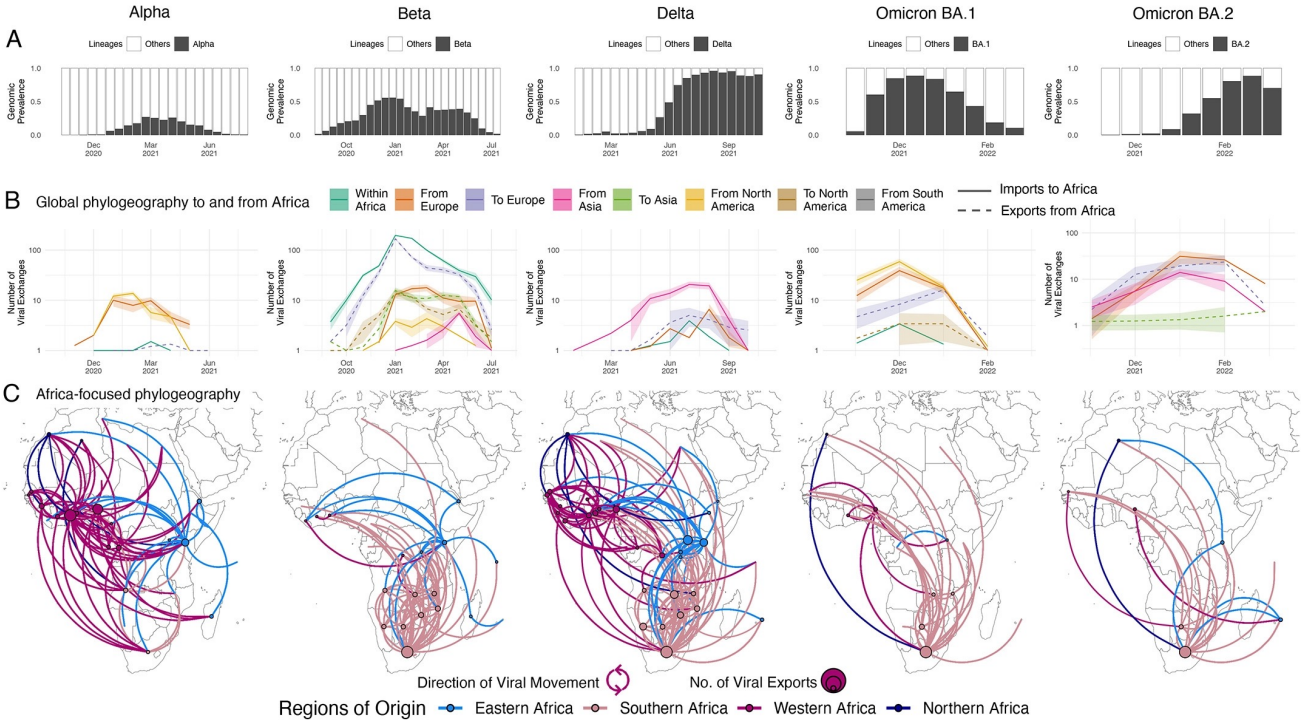
The launch of the new large Illumina sequencer, the Novaseq X, which can produce whole human genomes at US$200, is a potential gamechanger.

While cheaper genomes can decrease genomics disparity of Global South, it could also increase the disparities in the region and it will be our job to make sure that we remain scientifically competitive.

Another highlight of my trip was to spend time with people like @EricTopol, @fdesouza, @clopezcorrea, @christian_happi, @BarackObama and get feedback on our use of genomics to respond to the COVID-19 pandemic. We are now engaging to try to make genomics more accessible for other diseases.

Twitter thread on this event:
https://twitter.com/Tuliodna/status/1575842511607586816

SCIENCE: The evolving SARS-CoV-2 epidemic in Africa: Insights from rapidly expanding genomic surveillance.



Inferred viral dissemination patterns of VOCs within Africa. (A) Genomic prevalence of VOCs Alpha, Beta, Delta and Omicron in Africa over time. (B) Inferred viral exchange patterns to, from and within the Africa continent for the four VOCs (Omicron as BA.1 and BA.2) based on case-sensitive phylogeographic inference. (C) Dissemination patterns of the VOCs within Africa, from inferred ancestral state reconstructions performed on Africa enriched datasets, annotated and colored by region in Africa.

Investment in SARS-CoV-2 sequencing in Africa over the past year has led to a major increase in the number of sequences generated, now exceeding 100,000 genomes, used to track the pandemic on the continent.

Our results show an increase in the number of African countries able to sequence domestically, and highlight that local sequencing enables faster turnaround time and more regular routine surveillance. Despite limitations of low testing proportions, findings from this genomic surveillance study underscore the heterogeneous nature of the pandemic and shed light on the distinct dispersal dynamics of Variants of Concern, particularly Alpha, Beta, Delta, and Omicron, on the continent.

Sustained investment for diagnostics and genomic surveillance in Africa is needed as the virus continues to evolve, while the continent faces many emerging and re-emerging infectious disease threats.

In conclusion, Africa needs to continue expanding genomic sequencing technologies on the continent in conjunction with diagnostics capabilities.

This holds true not just for SARS-CoV-2 but for other emerging or re-emerging pathogens on the continent. For example, WHO announced in February 2022 the re-emergence of wild polio in Africa, while sporadic influenza H1N1, measles and Ebola outbreaks continue to occur on the continent.

The Africa CDC has estimated that over 200 pathogen outbreaks are reported across the continent every year. Beyond the current pandemic, continued investment in diagnostic and sequencing capacity for these pathogens could serve the public health of the continent well into the 21st century.

Link to paper: Tegally, H. et al. Science 2022 https://doi.org/10.1126/science.abq5358 (2022)

NATURE: 100,000 coronavirus genomes reveal COVID's evolution in Africa

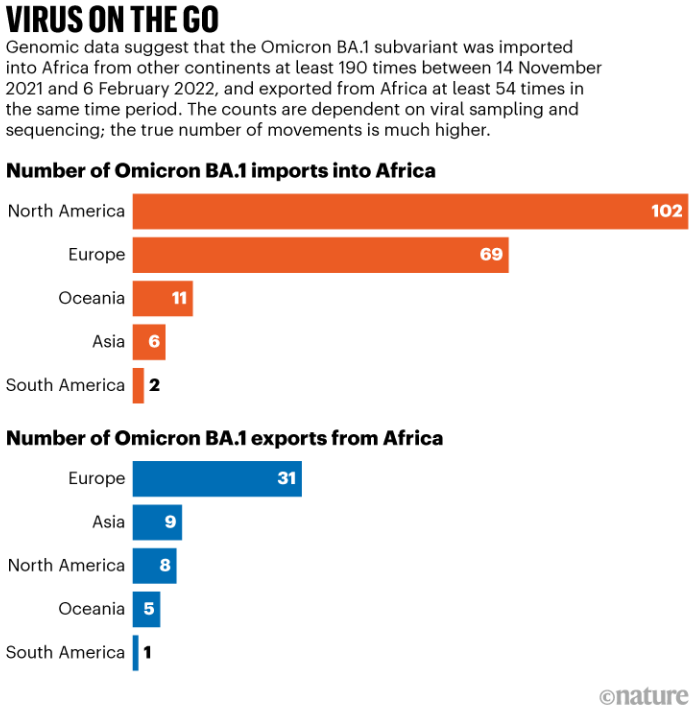
By Diana Kwon, Nature, October 3rd, 2022

New SARS-CoV-2 variants arise and spread with great stealth, but that hasn't stopped Africa's genomic sleuths from spotting a host of these threats — and alerting the rest of the world.

Now an analysis details how the rapid growth in Africa's sequencing capacity has aided global SARS-CoV-2 surveillance. It also reveals that most variants were imported into Africa more often than they were exported from the continent.

The study, published in Science, shows that **"African scientists can work together to produce high-level science",** says co-author Tulio de Oliveira, a bioinformatician at Stellenbosch University in South Africa. **"Before, it was almost the norm that African scientists would work with a northern partner to produce that kind of level of science."**

"This paper is incredible," says Jeremy Kamil, a virologist at Louisiana State University in Shreveport. **"The world needs to see more collaborations like this."**



Link to news at Nature:
https://www.nature.com/articles/d41586-022-03070-3

Link to paper at Science:
Tegally, H. et al. Science 2022
https://doi.org/10.1126/science.abq5358 (2022)

Prof. Frank Tanser joins CERI at SU as Director of Population Health Program

We are delighted to announce that Professor Frank Tanser has joined CERI as Director of Population Health Innovation. Frank is a leading South African scientist whose research aims to evaluate and design intervention strategies to drive back the HIV epidemic and its negative consequences in communities hardest hit by the epidemic. His pivotal work over the past 24 years has provided substantial insights into the evolving and dynamic nature of the HIV epidemic and its key drivers, informing HIV prevention and treatment efforts in sub-Saharan Africa. He has spent the last 3-years working in the UK where he was the founding director of the Lincoln International Institute for Rural Health.

Frank holds masters degrees from Imperial College London and Rhodes University and a doctorate from UKZN. He is a faculty at Africa Health Research Institute (AHRI), an associated Professor at the Department of Global Health at Stellenbosch University. He also holds honorary professorships at University College London (UCL) and Monash University Malaysia. He currently serves on the board of The Lancet HIV. Frank has been the recipient of numerous scientific grants and has raised over $85-million in external research funding to date in his career. He was a founder member of the Africa Centre for Population Health (now Africa Health Research Institute) in 1998 and was responsible for building Africa's first comprehensive population-based GIS system at the centre.

"We are particularly excited about the return of Prof. Frank Tanser to South Africa. Prof. Tanser appointment will create a thriving Population Health Research Group at CERI in collaboration with Department of Global Health at SU and AHRI" said Prof Tulio de Oliveira.

"I am delighted and honoured to be back in South Africa working at Stellenbosch and with CERI. I love this continent and there is no place in the world I would rather be right now and here is where I feel that I can make the biggest impact", said Tanser. As a grant's maverick, Prof Tanser in his first 3 weeks at Stellenbosch has already secured an NIH R01 grant of US$2.5 million which will use 'epidemic intelligence techniques' to reduce HIV incidence in rural settings

and train young researchers on advanced spatial epidemiological analysis.

In 2017 Frank was honoured by the Medical Research Council with the gold medal scientific achievement award in recognition of the excellence of his research. The award recognises outstanding scientists who have undertaken seminal research that has impacted directly on the health of populations in developing countries.

In 2019, The Royal Geographical Society awarded him the Back Award for "conducting applied research that has made an outstanding contribution to the development of national or international public policy".

Frank has published over 250 papers in high-ranking international journals and his research has been cited over 32 000 times.

NEWS: CERI & KRISP delegation at the World Health Summit, Berlin

The World Health Summit (WHS 2022) was the first World Health Summit together with WHO

WHO has been a strong strategic partner of the World Health Summit since its very beginning. WHS and WHO are both dedicated to the well-being of all people: To give everyone everywhere the chance to live a healthy live is a global effort, and the key to achieve better health for all lies in collaboration and open dialogue, guided by science. This is what WHS 2022 stands for.

Therefore, WHO brought key financial institutions, investors, donors, and foundations together to discuss the investment in global common goods. Connecting stakeholders has always been a defining feature of the World Health Summit. Together with WHO we are welcomed heads of state, numerous ministers from all over the world, heads of international agencies, representatives of the G7 and the G20, the European Union, and the African Union – as well as civil society leaders and the private sector, including the health tech and the food industry.

Dr. John Nkengasong won the Virchow Prize for Global Health Award Ceremony - 15 October 2022 KRISP and CERI managed to send five of our young & brilliant researchers to Berlin, they of course, are at the award of Dr. J Nkengasong.

Link WHS 2022:
https://www.worldhealthsummit.org

Africa was well represented from CERI and KRISP and included (L-R): Dr. San Emmanuel James (Uganda), Dr. Eduan Wilkinson (South Africa), Dr. Houriyah Tegally (Mauritius)), Dr. Monika Moir (South Africa), and Ms Jenicca Poongavanan (Mauritius).

NEWS: German-Africa Prize won by scientists who identified omicron

Virologist Sikhulile Moyo in Botswana and South Africa-based bioinformatics scientist Tulio de Oliveira have won this year's German Africa prize for their work identifying the COVID-19 variant omicron.

Through their research and by reporting the variant to the World Health Organization (WHO), they "contributed significantly to a better understanding of the dynamics of the pandemic and the world's swift response to it," the independent prize jury found.

Infectious diseases have "not only national but continental and global impact so it's great to be recognized," said Tulio de Oliveira, the director of the Centre for Epidemic Response and Innovation at South Africa's Stellenbosch University and KwaZulu-Natal Research Innovation and Sequencing Platform (KRISP) at UKZN. “What really gives us satisfaction ... is to do high level science and translate that to policies that save lives."

"Wow, it's a great honor," said Zimbabwe-born Sikhulile Moyo, laboratory director at the Botswana Harvard AIDS Institute Partnership, a collaborative research initiative between Harvard University and Botswana's government.

But, Moyo added, the award doesn't represent the success of one person, and he was "glad to receive it on behalf of many African scientists.”

Both scientists continue their "excellent work undeterred", the German Africa Foundation (DAS), which has been giving out the German Africa Award since 1993, said in a statement.

"Professor Tulio de Oliveira and Dr Sikhulile Moyo are thus a shining example of expertise, integrity and courage," DAS said.

"They prove ... that top medical research is also at home in Africa and that the continent has successful crisis management in the global pandemic from which Europe can and should learn."

German-Africa Prize will be received in Berlin on the 25 November 2022.

NEWS: Senegal Bioinformatics Workshop, Dakar, 3-15 October 2022.

RESSEF and UCAD in Senegal organized and hosted a bioinformatics workshop that will included one week of virtual sessions on **October 3 - 7, 2022**, and one week of in-person sessions in Senegal **October 10 - 15, 2022.** Dr. Tulio de Oliveira of CERI and Dr. Luiz Alcantara Jr. of FIOCRUZ and their teams assisted in facilitating this training. They are at the forefront of capacity-building efforts in bioinformatics, with experience leading large-scale bioinformatics training programs.

This workshop was held with support from CREID research centers, UWARN, PICREID, WAC-EID, and WARN-ID. The training covered wet and dry laboratory components of genomic sequencing and resulting bioinformatics, using SARS-CoV-2 as an example. Learners gained skills in wet laboratory processes, genome assembly, quality control, submission to GISAID and NCBI, data interpretation, and discussion, among other skills.

This workshop was available to laboratory technologists, post-doctoral research fellows, bioinformaticians, clinical infectious disease specialists, senior scientists, and other roles where training in bioinformatics would be helpful. The Workshop organizers gratefully acknowledge financial support from: NIAID (1U01AI151698) and the Office of Global Research, US National Institutes of Health, UWARN and the University of Washington, WAC-EID, University of Texas Medical Branch, CERI at SU, KRISP at UKZN and The Rockefeller Foundation.

Link to workshop website: https://cerid.uw.edu/uwarn/senegal-bioinformatics-workshop

FEATURED AT SCIENCE: An Advocate for Africa

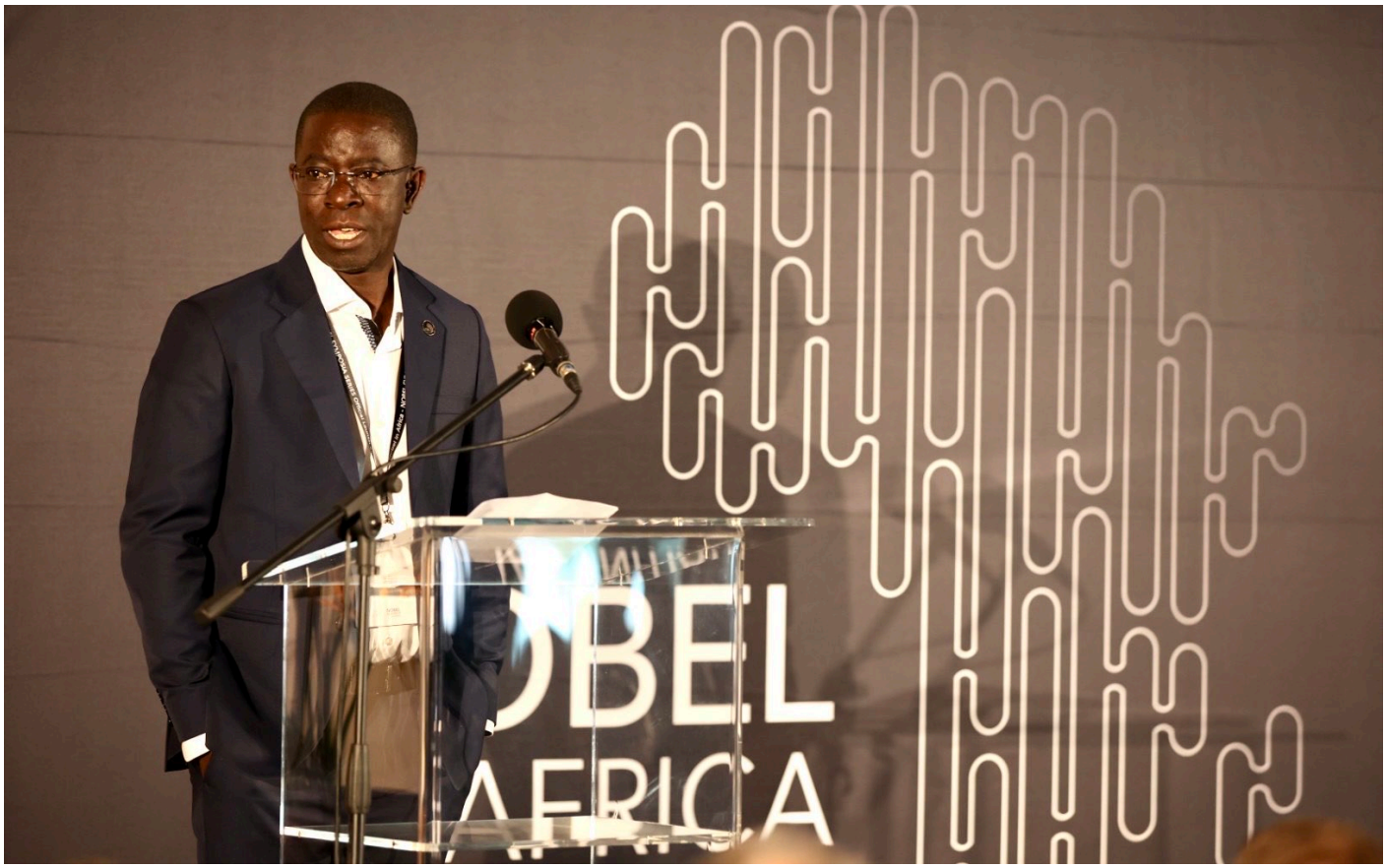
Perhaps no single person has done more to alert the world to dangerous new variants of the pandemic coronavirus than Tulio de Oliveira, whose team first flagged the emergence of both the Omicron and Beta variants in South Africa. Yet the pony-tailed, Brazilian-born bioinformatician at Stellenbosch University is more than an extremely talented disease detective. He has recently become the most influential advocate for scientists in the Global South.

This spring, he and other scientists called for dropping location-based names for monkeypox, which stigmatized Africa; days later, the World Health Organization complied. In May, Lancet published his stinging editorial about the lack of respect and funding for African researchers, days after TIME magazine named him one of the 100 most influential people of 2022. And when his team's world-shaking identification of the Omicron variant last Thanksgiving led countries to reimpose bans on travelers from South Africa, he took to Twitter to call them "evil" and "stupid."

The deceptively soft-spoken Oliveira, 46, has big ambitions: He is launching a sophisticated $100-million genome sequencing center where he's already training dozens of African scientists from more than 30 countries, preparing them to avert the next pandemic. This profile of a complex man and his fight to turn Africa into a medical science powerhouse spotlights the huge strides that are being made in African medical science, and how that science has come into its own during the coronavirus pandemic.

Link: https://www.science.org/content/article/covid-19-sleuth-making-friends-and-foes-advocating-african-science

Nobel in Africa: First Nobel in Africa Symposium, 24-28 Oct 2022



Nobel in Africa Symposia provide a unique opportunity to support and showcase advanced research and scholarship on the African continent, and to promote research excellence and collaborative scholarship in Africa in conversation with the rest of the world.

Stellenbosch University rector and vice-chancellor Professor Wim de Villiers called the event a "momentous occasion". Addressing the audience of guests, which included dignitaries from around the world, De Villiers said, "The Nigerian writer Wole Soyinka, the first black African to win a Nobel Prize for Literature, said; 'No one is rich enough to buy yesterday, but if you hustle hard tomorrow could be yours', and Africa has been hustling for years.

"In the academic world, researchers and thought leaders from our continent have been fighting tooth and nail to take up spaces in the world and to make their voices heard.

"With the Nobel in Africa Symposia Series coming to Stellenbosch, to Africa, our voices are being amplified loud and clear."

Prof. Tulio de Oliveira was one of the keynote speakers on the Nobel in Africa Symposium on the role of big data and genomics in Africa to guide the world pandemic response.

Viewpoint

Ethics and governance challenges related to genomic data sharing in southern Africa: the case of SARS-CoV-2

Keymanthri Moodley, Nezerith Cengiz, Aneeka Domingo, Gonasagrie Nair, Adetayo Emmanuel Obasa, Richard John Lessells, Tulio de Oliveira

Data sharing in research is fraught with controversy. Academic success is premised on competitive advantage, with research teams protecting their research findings until publication. Research funders, by contrast, often require data sharing. Beyond traditional research and funding requirements, surveillance data have become contentious. Public health emergencies involving pathogens require intense genomic surveillance efforts and call for the rapid sharing of data on the basis of public interest. Under these circumstances, timely sharing of data becomes a matter of scientific integrity. During the COVID-19 pandemic, the transformative potential of genomic pathogen data sharing became obvious and advanced the debate on data sharing. However, when the genomic sequencing data of the omicron (B.1.1.529) variant was shared and announced by scientists in southern Africa, various challenges arose, including travel bans. The scientific, economic, and moral impact was catastrophic. Yet, travel restrictions failed to mitigate the spread of the variant already present in countries outside Africa. Public perceptions of the negative effect of data sharing are detrimental to the willingness of research participants to consent to sharing data in postpandemic research and future pandemics. Global health governance organisations have an important role in developing guidance on responsible sharing of genomic pathogen data in public health emergencies.

Lancet Glob Health 2022

Published Online October 26, 2022 https://doi.org/10.1016/S2214-109X(22)00417-X

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Introduction

Africa has been home to exploitative research practices for decades. The terms safari research and parachute research arose out of this culture of exploitation.[1] Public health crises have exposed the continent's vulnerability to such research practices, most starkly during previous Ebola virus outbreaks.[2] The current COVID-19 pandemic is no exception. Genomic data for pathogens with epidemic and pandemic potential have proven invaluable in diagnostics, therapeutics, vaccine development, and public health planning. Consequently, the promotion and encouragement of the sharing of pathogen genomic sequence data has been pivotal. Before the pandemic, global research teams carefully guarded their research findings for months until data analysis and publication had occurred.[3] However, this practice is incompatible with public health emergencies during which the health and lives of the global population are at risk.[4] Open data sharing with scientists and governments allows for rapid assessment of the extent of the public health threat, development and initiation of diagnostic test kits, development of vaccines, and innovative response measures.[4] At the same time, surveillance and research teams require credit for the work they do. This credit is particularly relevant in low-income and middle-income countries (LMICs) because the resources and skills needed for data analysis are unevenly distributed such that high-income countries (HICs) usually have more capacity to analyse data that are openly accessible.[2] Although this concern applies to the sharing of samples and data, the sharing of pathogen genomic sequence data is used in this Viewpoint to highlight that striking a balance between advancing science through data sharing, preventing exploitation, and maintaining scientific integrity creates an ethical dilemma for LMIC researchers.[1]

The COVID-19 pandemic saw many research teams supporting national public health institutes that are usually responsible for public health surveillance. To some extent, this pandemic opened debate on different legal and ethical frameworks surrounding public health surveillance and research. The WHO guidelines on ethical issues in public health surveillance includes guideline 15, which states: "During a public health emergency, it is imperative that all parties involved in surveillance share data in a timely fashion."[5]

Data sharing options currently occupy a spectrum that ranges from open access databases without any restrictions (US GenBank and European Nucleotide Archive) to databases with restricted access, such as the Global Initiative on Sharing Asian Influenza Data (GISAID). The different options have caused controversy, with prominent scientists in North America and Europe appealing for unrestricted access[6] and scientists from Africa requiring sufficient protections for those who generate and share data as per the GISAID terms and conditions.[7]

In September, 2021, UNESCO published a Draft Recommendation on Open Science, recommending global data sharing of science, technology, and innovation.[8] Likewise, several funding bodies require unrestricted data sharing. Policy makers have promoted open science for decades to discourage a reluctance to share data.[9] Hence various research groups, policy makers, and funders are in disagreement over preferences.

An effort at data sharing occurred during the COVID-19 pandemic. However, this scientific goodwill left southern African countries unjustly ostracised and the global scientific community polarised. Negative consequences associated with data sharing, whether real or perceived, discourage transparency as Africa is often considered last for all interventions required to manage a pandemic—diagnostics, therapeutics, and vaccines—yet first in line for travel bans.[10]

CERI & KRISP Papers

OPEN ACCESS

The evolving SARS-CoV-2 epidemic in Africa: Insights from rapidly expanding genomic surveillance
Tegally H, San JE, Cotten M, Moir M, Tegomoh B, Mboowa G, Martin DP, Baxter C, … More 300 African authors … Tebeje YK, Tessema SK, de Oliveira T, Happi C, Lessells R, Nkengasong J, Wilkinson E.. **Science**. 2022 Sep 15:eabq5358. doi: 10.1126/science.abq5358.

Ethics and governance challenges related to genomic data sharing in southern Africa: the case of SARS-CoV-2
Moodley K, Cengiz N, Domingo A, Nair G, Obasa AE, Lessells RJ, de Oliveira T. **Lancet Global Health,** DOI:https://doi.org/10.1016/S2214-109X(22)00417-X

Antiretroviral therapy adherence patterns, virological suppression, and emergence of drug resistance: A nested case-control study from Uganda and South Africa.
Tyagi A, Tong Y, Rabideau DJ, Reynolds Z, De Oliveira T, Lessells R, Amanyire G, Orrell C, Asiimwe S, Chimukangara B, Giandhari J, Pillay S, Haberer JE, Siedner MJ; META Study Investigators. **Antivir Ther**. 2022 Oct;27(5):13596535221114822. doi: 10.1177/13596535221114822. PMID: 36263960.

Molecular Epidemiology and Trends in HIV-1 Transmitted Drug Resistance in Mozambique 1999-2018.
Ismael N, Wilkinson E, Mahumane I, Gemusse H, Giandhari J, Bauhofer A, Vubil A, Mambo P, Singh L, Mabunda N, Bila D, Engelbrecht S, Gudo E, Lessells R, de Oliveira T. **Viruses**. 2022 Sep 9;14(9):1992. doi: 10.3390/v14091992.

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Funded by:

Disclaimer: CERI at SU and KRISP at UKZN wishes to express its gratitude to the following funders for their generous support for the production of this report: The Rockefeller Foundation, the Technology Innovation Agency (TIA) of the Department of Science and Innovation (DSI), DIPLOMICS, a Research Infrastructures of the DSI, the South African Medical Research Council (SAMRC), European Commission (EC) and the National Institute of Health. The newsletter is published as open access under a Creative Commons ShareAlike 30 Unported license (http://creativecommonsorg/licenses/by-sa/30/) and is available in printed format as well as electronically as PDF, Web-format, etc The contents of this report and the opinions expressed herein are solely the responsibility of the authors and do not necessarily represent the official views or policies of any of the funders.