

CERI & KRISP Newsletter

Volume 6, Issue Number 8, August/September 2023



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Introduction

Welcome to another edition of the CERI/KRISP monthly newsletter. This month newsletter's cover shows the devastation resulting from extreme weather events in Malawi. This is the topic of our main feature article, published this month in Science, that highlights the link between climate change and infectious diseases. We also highlight how climate change is impacting diseases such as cholera using the genomic epidemiology of the cholera outbreak in Malawi 2022-2023 as an example. Genomic epidemiology was also used in a study from Brazil that unveils the dynamics and spatial corridor behind the Yellow Fever virus outbreak in the country.

We also feature some of the highlights from the recent VEME workshop that was hosted by CERI at Stellenbosch University and brought together 158 individuals from 39 different countries.

We include a summary of the inaugural lecture by the CERI Director that focused on two decades of genomic excellence.

We also feature the NIH-funded HIV prevention project in Zimbabwe to empower men that is being led by Prof. Frank Tanser and advertise the postdoctoral positions in the Population Health Innovation Programme at CERI for aspiring postdoctoral fellows.

PUBLICATION: Will climate change amplify epidemics and give rise to pandemics?

Science, 25 Aug 2023, Vol 381, Issue 6660

While the world is gradually recovering from the grasp of the COVID-19 pandemic, there's another crisis that's gathering momentum faster than we anticipated. Climate change, as we all know, has been dominating conversations for a while now, and it's affecting us more than we might realize.

Countries across the globe are grappling with the aftermath of extreme events triggered by climate change. They're battling wildfires, reconstructing infrastructure wiped out by floods, and trying to adapt to a hotter and more unpredictable world. But amidst all of this, there's a new danger lurking in the shadows – the intricate connection between climate change and infectious diseases.

A recent analysis highlighted that over half of the known human pathogens could be worsened by climate change and this is happening right now. Just under two years since the last major wave of the SARS-CoV-2 virus, a slew of pathogens has emerged.

Some of these pathogens are less unfamiliar, like Mpox and the chikungunya virus, while others have been known to us for ages, such as *Vibrio cholerae* (the cause of cholera) and *Plasmodia* parasites (responsible for malaria). What's even scarier is the potential release of pathogens trapped in permafrost due to warming temperatures – a concept that might sound alarmist. While some might think that climate change and epidemics are either exaggerated or transient, there's overwhelming evidence linking climate change to the surge of disease outbreaks and epidemics. It's no longer a question of "if," but "when" the next pandemic will be set off by these events. So, will climate change amplify epidemics and lead to pandemics? Unfortunately, the answer seems to be a resounding "yes," if we don't take meaningful action.

Link to full publication:

<https://www.science.org/doi/10.1126/science.adk4500>

**Ten key take home messages:**

1. Climate change is on everyone's minds, but its connection to infectious diseases is being overlooked.
2. More than 50% of known human pathogens could worsen due to climate change.
3. Climate change worsens disease outbreaks through rising temperatures, changing environmental conditions, and extreme events like floods.
4. Rise in temperature is altering disease transmission conditions, aiding disease vectors like mosquitoes in new areas.
5. Extreme climate events lead to quick epidemics, catching regions unprepared and escalating if infectious diseases spread. The recent deadly cholera outbreaks in Pakistan and Malawi underscore the devastating consequences.
6. Globalization facilitates the spread of pathogens across borders, as seen with SARS-CoV-2 variants.
7. Climate change could increase human-wildlife interactions, heightening the risk of pathogen spillover.
8. 2024 is predicted to be warmer due to El Niño, possibly causing severe drought and mass migrations.
9. Emergency responses to climate disasters should include strategies to combat disease outbreaks.
10. Health systems must adapt to changing disease patterns and global mobility.

Science Magazine @ScienceMagazine · Aug 28
Will #ClimateChange amplify epidemics and give rise to pandemics?

"Most certainly yes, if the world stands still," argue @Tuliodna and @houzhou in a new #ScienceExpertVoices article. [scim.ag/3T8](https://www.science.org/doi/10.1126/science.adk4500)

“
**The link between
climate change
and infectious disease
should raise
a call to action ...**

Tulio de Oliveira and Houriyah Tegally
Centre for Epidemic Response and Innovation

ALT

PUBLICATION: Genomic epidemiology of the cholera outbreak in Malawi 2022-2023

medRxiv, August 24, 2023 <https://doi.org/10.1101/2023.08.22.23294324>

Cholera is an acute diarrhoeal disease caused by contaminated food or water. The 2022/23 cholera outbreak in Malawi has been the largest outbreak on record with over 58,000 confirmed cases and 1,761 deaths as of May 2023.

To establish the origin of this outbreak, we partnered with the Malawi Ministry of Health and obtained 70 *V. cholerae* isolates, performed on-site DNA extraction, library preparation, and sequenced 49 isolates. A time-scaled maximum likelihood phylogeny, based on high quality SNPs (hqSNPs) of the Malawi isolates and 2,159 publicly available strains from Africa, Asia, Americas, and Europe, indicated single origin introduction of the outbreak, likely from Pakistan (Figure 1).

We estimate the introduction of this lineage in Malawi, the time to the most common ancestor (tMRCA), being July 2022 with a 95% Highest Posterior Density between March-October 2022. The interval of the introduction correlates with the beginning of the reported cases for the current cholera outbreak in the country.

Prior to the cholera outbreak, Malawi experienced two cyclones (Ana and Gombe) that caused flooding right before the introduction of the strain. Initial floods do not correlate with amplification of cases and suggest that the introduction was followed only by low circulation. However, floods that occurred in the rainy season of 2022 in Malawi seems to amplify the epidemic (Figure 2).

Cholera is surging across the globe, and increased frequency and intensity of floods and cyclones due to climate change will exacerbate cholera outbreaks in Africa and worldwide.

Link to full publication:

<https://doi.org/10.1101/2023.08.22.23294324>

Figure 2: Epidemiological trends of the recent cholera outbreak in Malawi. Cumulative number of confirmed cholera cases and deaths are depicted on the y-axes from February 2022 to April 2023. Green dots portray the daily number of pixels demonstrating flooding conditions across Malawi as detected from remotely sensed satellite imagery with the moving average shown as the dashed green line. Inferred time of introduction of a Pakistan strain into Malawi is annotated on the plot as well as the timing of cyclones and flooding events affecting Malawi.

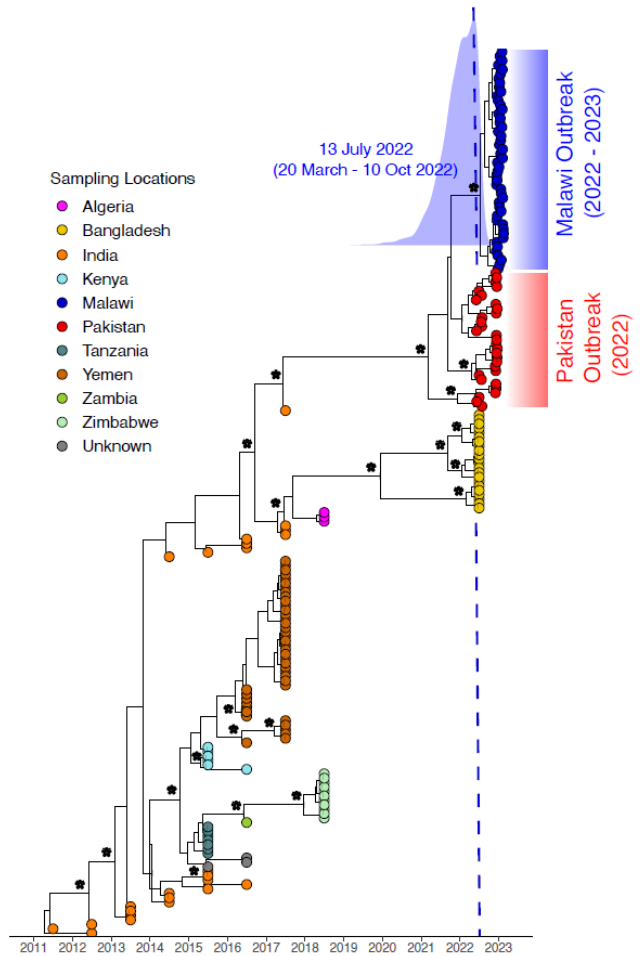
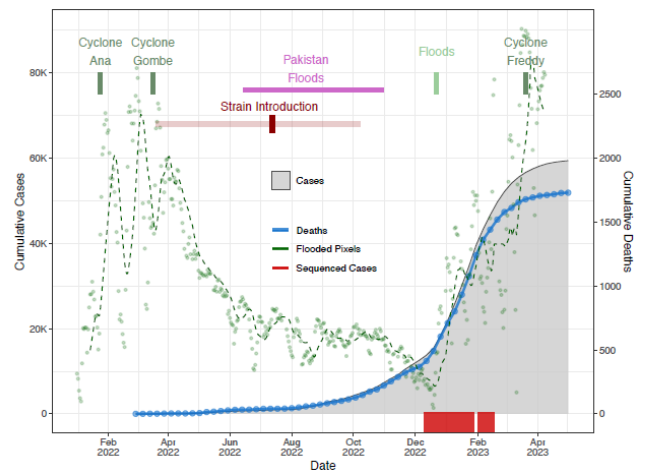


Figure 1: Origin and dispersal of recent cholera outbreak within Malawi. Time-resolved phylogeny depicting the clade containing genomes from the 2022 – 2023 outbreak in Malawi in blue (n= 49, sampled between 10 Dec 2022 and 17 Feb 2023) with a basal clade of genomes sequenced from Pakistan in 2022 in red. Time to the most common recent ancestor (TMRCA) estimated at 13 July 2022 (HPD 95%: 20 Mar – 10 Oct 2022). The posterior distribution of the TMRCA is shown as the blue curve. Bootstrap support values >0.9 are displayed with asterisks.



PUBLICATION: Genomic epidemiology unveils the dynamics and spatial corridor behind the Yellow Fever virus outbreak in Southern Brazil

Sci. Adv. 9,eadg9204(2023); DOI:[10.1126/sciadv.adg9204](https://doi.org/10.1126/sciadv.adg9204)

Despite the considerable morbidity and mortality of yellow fever virus (YFV) infections in Brazil, our understanding of disease outbreaks is hampered by limited viral genomic data. Here, through a combination of phylogenetic and epidemiological models, we reconstructed the recent transmission history of YFV within different epidemic seasons in Brazil. A suitability index based on the highly domesticated *Aedes aegypti* was able to capture the seasonality of reported human infections. Spatial modeling revealed spatial hotspots with both past reporting and low vaccination coverage, which coincided with many of the largest urban centers in

the Southeast (Figure). Phylodynamic analysis unraveled the circulation of three distinct lineages and provided proof of the directionality of a known spatial corridor that connects the endemic North with the extra-Amazonian basin. This study illustrates that genomics linked with eco-epidemiology can provide new insights into the landscape of YFV transmission, augmenting traditional approaches to infectious disease surveillance and control.

Link to full publication:

<https://www.science.org/doi/10.1126/sciadv.adg9204>

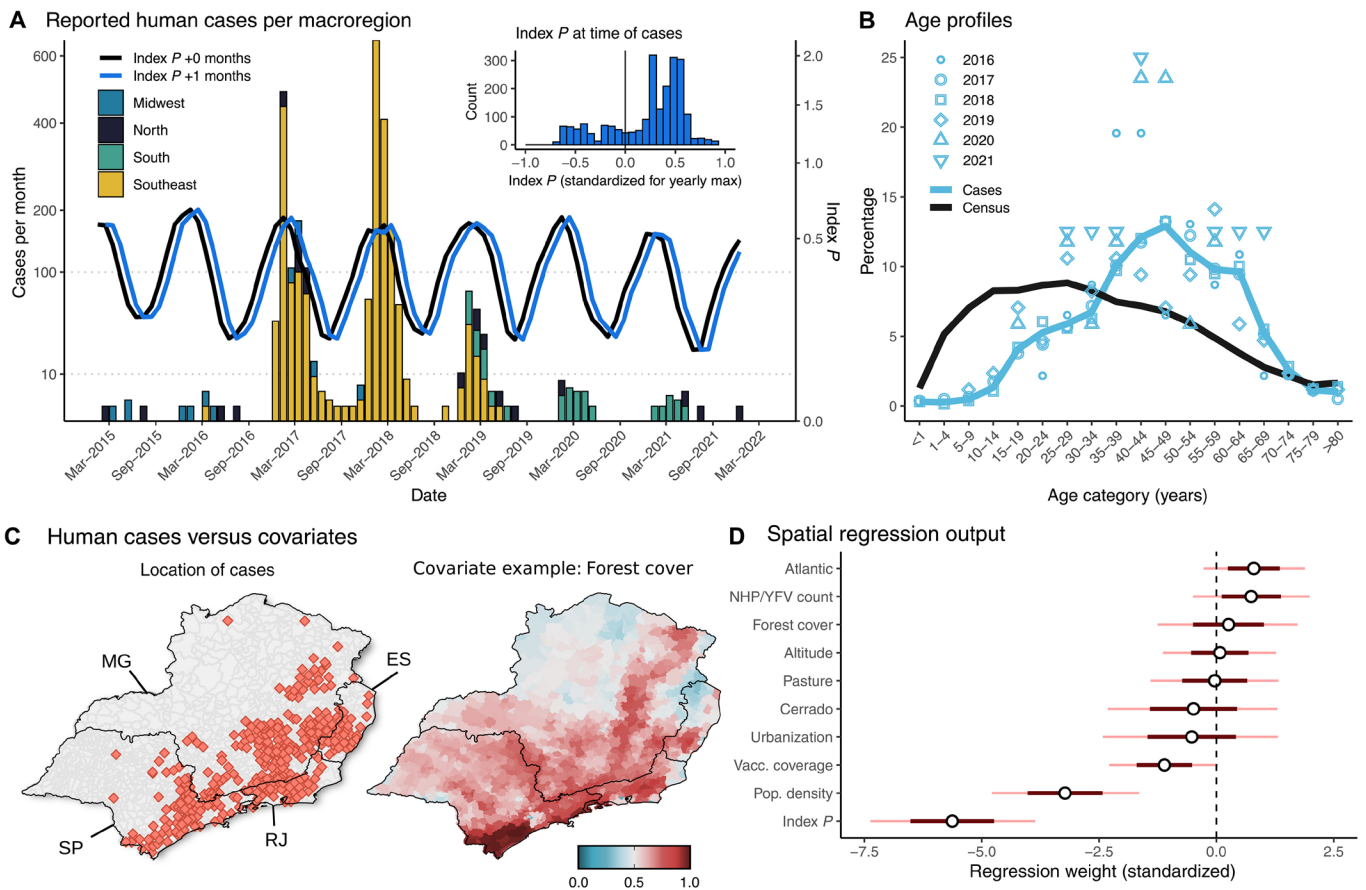


Figure. Human incidence of YFV in Brazilian macroregions, 2015–2022. (A) Time series of monthly reported human cases in four Brazilian macroregions and monthly mosquito-viral suitability measure (index P) aggregated (mean) across the macroregions. Index P is calibrated to YFV and *Aedes aegypti*, interpreted as spillover risk, and presented here index P is presented by the lines as baseline (black) and shifted by +1 month (blue). The inset plot shows the distribution (y axis) of human cases according to the value of index P (x axis) extracted at each time point of reported human YFV cases (shifted +1 month, standardized by yearly maximum). (B) Age distribution of human cases across the years (light blue) versus Census 2010 data (black), both aggregated across the Southeast and South macroregions. (C) Spatial distribution of human cases (red filled points) and one example of a spatial covariate (forest cover) used for modeling the Southeast macroregion. (D) Marginal posterior distributions for individual regression weights for the 10 covariates explored.

Unveiling the Power of Bioinformatics: VEME Workshop Leaves Lasting Impact



In the intricate web of scientific exploration, one thread stands out for its profound influence on clinical research and public health: bioinformatics. The week-long 27th International Bioinformatics & Virus Evolution & Molecular Epidemiology (VEME) Workshop, hosted by the Centre for Epidemic Response & Innovation (CERI) at Stellenbosch University from August 20th to 25th, recently concluded, leaving a trail of insights and inspiration. This workshop showcased the symbiosis between experts and enthusiasts, forging a path into the realm of molecular data analysis and its practical implications.

VEME, a pioneering workshop series, has long been a vanguard of cutting-edge bioinformatics training. In an era where data reigns supreme, VEME tackled the dire need for specialized knowledge. The event brought together eminent researchers from across the globe, united by the common goal of bridging theoretical concepts with real-world application. With their expertise, they illuminated the path for future bioinformatics maestros.

As the closing remarks of the event, Professor Anne-Mieke Vandamme, one of the organizers, eloquently summarized the main pillars of VEME's purpose. She stated, "The VEME workshop has three main pillars: to bring people together, to provide methodology and training, and to empower participants to produce tangible results." These pillars encapsulate

the essence of VEME, emphasizing collaboration, skill-building, and impactful outcomes.

At the heart of VEME27's triumph lay its commitment to building capacity. In today's landscape, where torrents of genomic data flow ceaselessly, the ability to harness this wealth is revolutionary. The workshop's structure revolved around four key modules: Phylogeny Inference, Evolutionary Hypothesis Testing, Next Generation Sequencing, and From Trees to Public Health Policy.

Professor Tulio de Oliveira, another organizer, captured the essence of the workshop's impact in a tweet: "Building expertise to quickly respond to epidemics." This sentiment resonated throughout the event, as participants engaged in a half-day module on developing genomic surveillance dashboards. The enthusiasm and interest were palpable, reflecting the shared commitment to rapid epidemic response.

The 2023 VEME transcended borders, uniting 158 eager minds from 39 countries. Through immersive hands-on experiences across the workshop's modules, participants engaged with genomics analysis under the mentorship of 44 top-tier experts. One of the teachers, from the Rockefeller Foundation & Indiana University, USA, reflected on the event, tweeting, "That's a wrap on #VEME2023! Great to catch up with colleagues from across the globe....! Can't wait for next year in #Seattle #VEME2024."

Beyond the remarkable statistics, VEME has been hosted in 18 different countries across its 27 editions. It is an integral part of a broader African Genomics Capacity Building Program, further underscoring its significance in bolstering scientific expertise on the continent.

The workshop's impact extended beyond its core activities. A public lecture, hosted as part of the event, drew more than 300 attendees. World-leading experts, Professors Edward Holmes and Marion Koopman, delivered insights that resonated far and wide. Edward C. Holmes, a Professor of Virology at the University of Sydney, Australia, is renowned for his research on the evolution and spread of infectious diseases. Marion Koopmans, a virologist and Professor at Erasmus

University Medical Center in Rotterdam, Netherlands, is recognized for her work in emerging infectious diseases, particularly zoonotic viruses with the potential to jump from animals to humans.

As the curtains fall on #VEME2023, the legacy of collaboration, shared knowledge, and unwavering dedication prevails. For those captivated by the confluence of bioinformatics, virus evolution, and molecular epidemiology, VEME stands as a beacon of opportunity. Its reverberations are set to shape research, public health, and the scientific landscape for years to come.



Prof Marion Koopmans at the public lecture



Prof Tullio de Oliveira (left) and Prof Luiz Alcantara (right), co-organisers of VEME 2023 with the Keynote speakers, Prof Edward Holmes and Prof Marion Koopmans



Some of the African fellows



Prof Edward Holmes at the public lecture

Inaugural Lecture: Two Decades of Genomics Excellence



From L to R: Prof Sibusiso Moyo (Deputy Vice-Chancellor: Research, Innovation and Postgraduate Studies), Prof Tulio de Oliveira, Prof Nico Koopman Deputy Vice-Chancellor: Social Impact, Transformation & Personnel) and Prof Kanshukan Rajaratnam (Director: School for Data Science and Computational Thinking)

Professor Tulio de Oliveira delivered an inaugural lecture that celebrated two decades of groundbreaking genomics research in Africa.

Genomics, the study of genomes' structure, function, and analysis, has become a crucial tool in understanding pathogens, enabling precise responses to outbreaks and transforming healthcare across the continent.

Prof. de Oliveira's notable achievements include using genomics to exonerate doctors falsely accused of transmitting HIV-1 and hepatitis C in Libya and influencing global HIV prevention policies. His work also detected drug resistance in diseases like HIV-1 and tuberculosis, improving treatment outcomes.

During the COVID-19 pandemic, de Oliveira founded the Network for Genomic Surveillance South Africa (NGS-SA), identifying key SARS-CoV-2 variants. This approach garnered global recognition and set the stage for sustainable healthcare innovation in Africa.

This inaugural lecture held on September 5 highlighted two decades of genomics excellence under Prof. de Oliveira's leadership, propelling Africa into a new era of healthcare and research innovation.



Inaugural Lecture (2023): Prof Tulio de Oliveira

Watch: <https://shorturl.at/dfnyP>



News: HIV prevention project in Zimbabwe PrEP to empower men



Zimbabwe, like many other countries in Sub-Saharan Africa, faces the harsh reality of the HIV epidemic. With a substantial portion of the population affected by the virus, innovative approaches are urgently needed to combat its devastating impact.

At the heart of this pioneering initiative lies the promotion of Pre-Exposure Prophylaxis (PrEP) as a highly effective method for preventing HIV transmission among men. PrEP involves the use of antiretroviral medication by individuals who are at high risk of acquiring the virus. By adhering to a daily regimen, men can significantly reduce their chances of acquiring HIV infection, enabling them to take control of their sexual health and ultimately prevent onward transmission of HIV to their partners.

Professor Frank Tanser, a distinguished Epidemiologist and the Programme Director of Population Health Innovation at the Centre for Epidemiology and Research Innovation (CERI), who co-leads the project, emphasizes the importance of this initiative: "HIV is still prevalent, but we possess the knowledge and tools to make a significant impact. By engaging men through innovative strategies like PrEP, we can empower them to protect their sexual health and contribute to curbing the HIV epidemic." Led by Prof. Tanser in collaboration with the Biomedical Research Training Institute (BRTI) in Zimbabwe and other international partners from Africa, the United Kingdom, Germany, and the USA,

this project aims to address the challenges faced by men in preventing HIV transmission. The team of researchers seek to establish the impact of HIV self-test distribution through male social networks, coupled with innovative community-based support, on PrEP uptake among men in Eastern Zimbabwe. The objective is to engage hard-to-reach men and decrease barriers to the uptake of male HIV testing and prevention by reducing the need for engagement with clinics. By leveraging male peer networks for HIV self-testing distribution, the project aims to ignite curiosity and empower men to take charge of their sexual health.

Initial distributors, identified by the team, will receive an HIV self-test kit for personal use and additional kits to distribute to their peers, creating a ripple effect of awareness and prevention throughout the male community. With HIV self-testing, phone-based support, and improved risk perception, the project seeks to expedite PrEP initiation at local clinics, making it more accessible to men who may otherwise face barriers to traditional healthcare services.

By combining innovative technology and community-driven initiatives, the team challenges the existing stigma surrounding HIV prevention and empowers men to make informed decisions about their sexual well-being.

Read more: <https://ceri.org.za/news/?token=667>

Postdoctoral & PhD Research Fellowships in Population Health Innovation (6 positions)

The Population Health Innovation program at the Centre for Epidemic Response and Innovation ([CERI](#)) will undertake research focusing on the population-level effects of health interventions addressing the most important diseases affecting vulnerable populations across Africa. We are currently seeking to employ outstanding post-doctoral and PhD researchers to undertake cutting-edge research in three areas:

- i) Quantification of the shifts in burden of HIV incidence and underlying viral load patterns in a full population cohort in KwaZulu-Natal, South Africa
- ii) A cluster randomized controlled trial to increase uptake of HIV pre-exposure prophylaxis among men in Eastern Zimbabwe
- iii) Use of mobile phone GPS trace data for predicting HIV risk among mobile populations.

The fellows will have access to some of the finest longitudinal datasets in Africa. Fellows will interact with a team of leading trans-disciplinary researchers and will receive hands-on training in Epidemiological, Biostatistics and Geographical Information Systems techniques. Fellows will also be mentored by leading scientists, who commonly publish in some of the top journals of the field (i.e. Science, Nature, NEJM and Lancet). We are looking for statisticians, epidemiologists, geographers, bioinformaticians, econometricians and data scientists with advanced skills.

Fellows will be appointed at the **Centre for Epidemic Response and Innovation ([CERI](#))** in the **School for Data Science and Computational Thinking** at **Stellenbosch University** in South Africa. Fellows will be awarded a well-paid tax-free fellowship for up to 3 years. The positions are based at superb facilities in Tygerberg and Stellenbosch. Whilst it is expected that fellows will be based on campus, opportunity exist to spend time at CERI's field sites and/or with international collaborators for collaborative visits.

Minimum requirements for the Postdoctoral research fellowships are:

- PhD in Biostatistics, Epidemiology, Econometrics, Data Science, Geography or a closely related quantitative field
- Several high-quality publications as a first author
- PhD must have been obtained within the last 5 years

And minimum requirements for the PhD research fellows are:

Click here to apply

For more information, contact Prof. Frank Tanser ftanser@sun.ac.za

Deadline for applications: 1st September 2023, 1st October and 1st November 2023.

Start date is open to suit candidate needs

Feature: From Soccer Player to PhD candidate



Graeme Dor during the WEU Football Tournament in China

Graeme Dor's journey from soccer pitch to the realm of academia has been marked by dedication, passion, and a remarkable ability to balance multiple spheres. Armed with a BSc in GIS and Remote Sensing, as well as an MSc in the same field, both from the University of the Witwatersrand, Dor's academic foundation was strong. But it was his professional soccer career that lent a unique vibrancy to his story.

Growing up in Johannesburg, Dor's childhood was filled with both the thrill of sports and the altruism of humanitarian work ingrained in his family. Bonding with his elder brothers over games and sports, he developed the very skills that would later serve him well in his academic pursuits.

Dor's soccer journey was a decade-long tale of dedication. Playing for Wits FC, his skills on the field were matched by his commitment to studies and work. While soccer in South Africa often offers limited long-term prospects, Dor's dual commitment led him back to academia, where he recognized his passion for GIS, Data Science, and Public Health. The decision to pursue a PhD at CERI came naturally, aligning his interests and skills for the future.

The discipline and teamwork instilled in him through soccer find new life in academia. His research focus at CERI is applying geospatial and molecular epidemiological techniques to enhance understanding of endemic and emerging pathogens, particularly in Africa. Drawing parallels between the rigorous discipline required in both fields, Dor is poised to excel in academia just as he did on the field

Joining the academic community at CERI, Dor looks forward to collaboration and innovation. Guided by the inspiring researchers and academics he encountered during his public health work, he is eager to contribute and learn in equal measure. Reflecting on the intersections between sports and academia, Dor notes how resilience, a hallmark of his sporting career, influences his academic mindset.

Dor's aspirations extend beyond his PhD journey. He aims to create actionable insights into pathogen dynamics in Africa, establishing systems for ongoing monitoring. His future endeavors will continue to be at the forefront of public health. Notably, his inspirations extend from the soccer field to figures like Zinedine Zidane, who exuded effortless skill, and Sibusiso Vilakazi, embodying the hard work that underpins mastery. From soccer's "Mr. Mndi" to an emerging force in academia, Graeme Dor's narrative is a testament to passion, adaptability, and the powerful synergy between sports and scholarship.

Seminar: Emergence of neutralizing antibodies associated with clearance of SARS-CoV-2 during HIV-mediated immunosuppression

SCIENTIFIC SEMINAR SERIES

27 September 2023

Topic: Emergence of neutralizing antibodies associated with clearance of SARS-CoV-2 during HIV-mediated immunosuppression



Time: 12h00 | Wednesday, 27 September 2023

Venue: Room 3073, BMRI, Tygerberg Campus or Online*

Presenters: Prof. Alex Sigal



[*Click here to register.](#)



MEDICINE AND HEALTH SCIENCES
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RESPONSE AND
INNOVATION



GRANT WRITTING WORKSHOP

Stellenbosch University,
Tygerberg Campus



23-24 OCT, 2023
At 9:00 AM



You are invited

Young investigators, new Principal Investigators and post-doctoral students as well as research administrative staff and financial managers from research organisations in Africa are invited to apply to attend the 2-day workshop

Objectives

1. Equip participants with the basic and necessary skills to support the writing, submission and management of research grants,
2. Equip participants with the basic and necessary skills to develop their budgets and biosketches / CV,
3. Share grant administration skills, with emphasis on developing and submitting applications to funders

Limited space


There is no cost to attend the workshop, but space is limited. Only completed applications received by 15 September 2023 will be considered. Please complete the form [here](#)


REGISTER NOW





CERI & KRISP Papers



 **Will climate change amplify epidemics and give rise to pandemics?**
De Oliveira T, Tegally H, **Science** (2023), 381 (6660): DOI: 10.1126/science.adk4500

 **Genomic epidemiology of the cholera outbreak in Malawi 2022-2023**
Chabuka L, Choga WT, Mavian CN, Moir M, Tegally H, Wilkinson E, Naidoo Y, Inward R, Morgenstern C, Bhatt S, William Wint GR, Khan K, Bogoch II, Kraemer MUG, Baxter C, Tagliamonte M, Salemi M, Lessells R, Mitambo C, Chitatanga R, Bitilinyu-Bango J, Chiwaula M, Chavula Y, Bukhu M, Manda H, Chitenje M, Malolo I, Mwanyongo A, Mvula B, Nyenje M, de Oliveira T, Kagoli M. **medRxiv**, August 24, 2023: <https://doi.org/10.1101/2023.08.22.23294324>

 **Genomic epidemiology unveils the dynamics and spatial corridor behind the Yellow Fever virus outbreak in Southern Brazil**
Giovanetti M, Pinotti F, Zanluca C, Fonseca V, Nakase T, Koishi AC, Tscha M, Soares G, Gruber Dorl G, Rivaldo Venâncio da Cunha, . . . , Van Voorhis W, de Filippis AMB, Almiron M, Holmes EC, Ramos DG, Romano A, Lourenço J, Alcantara LCJ, dos Santos CN. **Science Advances** 2023; 9(35): eadg9204(2023). DOI:10.1126/sciadv.adg9204.

 **HIV-1 drug resistance in people on dolutegravir-based ART: Collaborative analysis of cohort studies.**
Loosli T, Hossmann S, Ingle SM, Okhai H, Kusejko K, Mouton J, Bellecave P, van Sighem A, Stecher M, Monforte AD, Gill MJ, Sabin CA, Maartens G, Günthard HF, Sterne JAC, Lessells R, Egger M, Kouyos R. **medRxiv** 2023: doi: 10.1101/2023.04.05.23288183.

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