



SACEMA
DST-NRF Centre of Excellence in Epidemiological Modelling and Analysis

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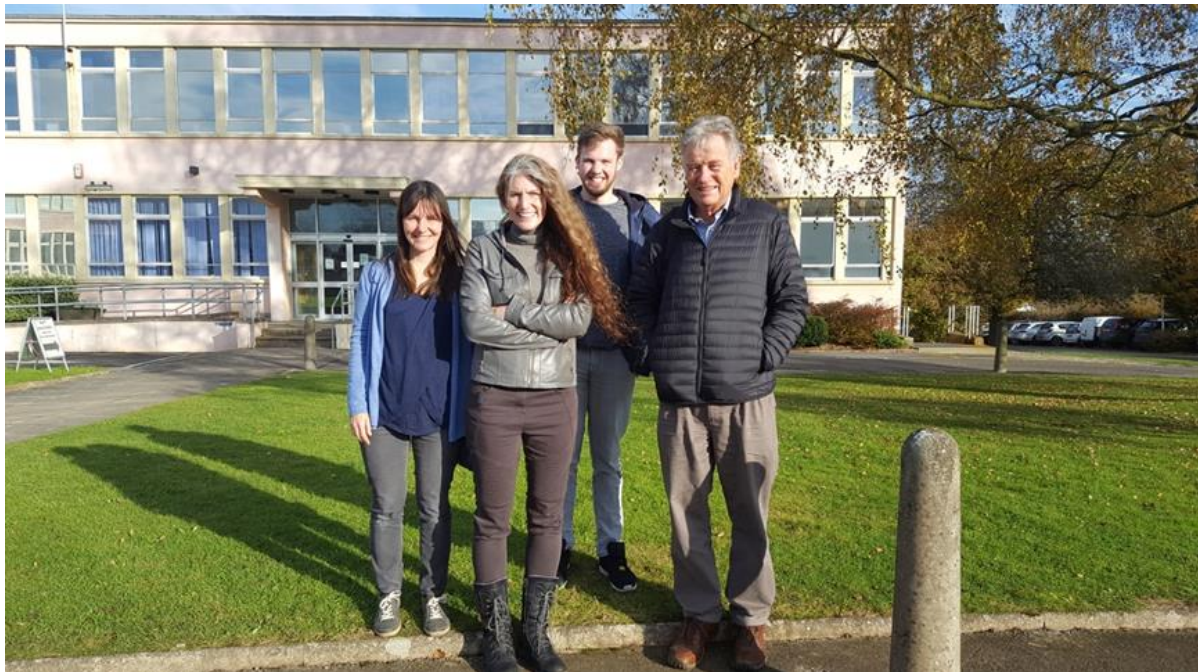
NEWS:

Launch of BBSRC project "Reproductive senescence in a long-lived vector"

On 15 November, several researchers from a range of institutions (Universities of Bristol, Oxford and Warwick; Liverpool School of Tropical Medicine; SACEMA) and disciplines (evolutionary ecology, vector biology, epidemiology) met to launch the BBSRC-funded project "Reproductive senescence in a long-lived vector". The aim of this project is to investigate maternal investment in tsetse flies, and specifically how this changes as mothers get older and impacts offspring quality and ability to spread disease. Investigating variation among vectors caused by maternal age or nutrition, and the implications of this variation, is an exciting development in the field of vector-borne disease research. Tsetse are fascinating in this respect as they have an unusually high level of maternal investment. Females give birth to live young, which are the same size and contain 150% of their mother's fat content at birth. This huge investment likely has implications for offspring survival and immunity, yet this is poorly understood. Over the next 3 years, Dr Sinead English and her co-investigators on the BBSRC-funded project - including Prof John Hargrove and Prof Glyn Vale at SACEMA - will be investigating how maternal investment changes with age both in wild and laboratory tsetse flies, and developing theoretical models to understand the evolutionary causes and epidemiological consequences of these processes.



Researchers meet to discuss project launch: from left to right, Kat Rock (Warwick), Jennifer Lord (LSTM), Steve Torr (LSTM), Lee Haines (LSTM), Rob Leyland (LSTM), Mike Bonsall (Oxford), John Hargrove (SACEMA).



After the meeting, some researchers visited the tsetse facility at Langford to see some real flies! From left to right, Sinead English (Bristol), Lee Haines (LSTM), Rob Leyland (LSTM), John Hargrove (SACEMA)

Maximizing ART for better health and zero new HIV infections in Swaziland – Close-out event

On 4 November 2017, SACEMA joined the close-out event to celebrate the end of the MaxART Early Access to ART for All (EAAA) study, which was launched in September 2014. The study aimed to better understand the feasibility, acceptability, clinical outcomes, affordability, and scalability of offering treatment for all people living with HIV in Swaziland. The event was very successful, as evident from the community attendance, speeches, drama, and songs all having a common message about “Shesha” – a native word meaning “test-and-start early/soon/quickly”. The king’s vision of eliminating the HIV epidemic in Swaziland by 2022 was emphasised through “know your status” activities throughout the day-long event, stressing the importance of reaching out to everyone in the community, young girls and boys, traditional leaders, pastors and the marginalised community such as sex workers and lesbian, gay, bisexual, and transgender people.

Swaziland is already showing a decline of more than 40% in new HIV infections since 2011 and is also making tremendous progress towards the UN 90-90-90 targets currently estimated at 85-87-92 by the second phase of the Swaziland HIV Incidence Measurements Study. SACEMA, being one of the partners in the MaxART consortium, will reproduce the study in the “model world” to measure the impact of the study within the study region and period. A projection study will also be carried out to extend the model world to the whole country.

Swaziland adopted the Test & Start policy nationwide on 1 October 2016. The MaxART project was very instrumental in providing valuable insight leading to this important decision by the country’s Ministry of Health. It is envisaged that the publication of MaxART study findings will be beneficial not only to Swaziland, but to other countries in the southern African region in the fight against HIV and AIDS.



MaxART consortium group representatives: Swaziland Ministry of Health, STOP AIDS NOW!, Clinton Health Access Initiative (CHAI), Swaziland Network of People Living with HIV and AIDS (SWANNEPHA) and Global Network of People Living with HIV (GNP+), Southern Africa HIV & AIDS Information Dissemination Service (SAFAIDS), University of Amsterdam, Harvard University, and DST-NRF Centre of Excellence in Epidemiological Modelling and Analysis (SACEMA).

Graduations 2018

Floris van Zyl graduated Cum Laude with a Master of Engineering (Electrical and Electronic Engineering) in the Faculty of Engineering at Stellenbosch University. His thesis, entitled “Characterisation of the dielectric properties of rhinoceros tissue using computer simulation and physical tissue phantom models,” was supervised by Prof Thomas Niesler and co-supervised by Prof Martin Nieuwoudt.



Floris van Zyl (right) celebrating his graduation

Fanuel Otieno graduated with an MSc in Mathematical Statistics in the Faculty of Science at Stellenbosch University. His thesis, entitled “A Meta-analysis of the Association between Intimate Partner Violence and Age Disparity in sub-Saharan Africa,” was supervised by Prof Wim Delva.



Fanuel Otieno

Christianah Olojede graduated with an MSc in Mathematical Statistics in the Faculty of Science at Stellenbosch University. Her thesis, entitled “Analysis of partner turnover rate and the lifetime number of sexual partners in Cape Town using generalized linear models,” was supervised by Prof Wim Delva.



Christianah Olojede celebrating her graduation

Kagiso Ramolotja graduated with an MSc in Mathematics in the Faculty of Science at Stellenbosch University. His thesis, entitled “Modelling human immune response dynamics to Mycobacterium Tuberculosis infection,” was supervised by Dr Gaston Mazandu and co-supervised by Prof Farai Nyabadza.



Kagiso Ramolotja (right) with Christianah Olojede (left)

Khaphetsi Mahasa graduated with a PhD in Mathematics in the Faculty of Science at Stellenbosch University. His dissertation, entitled “Mathematical modelling of tumour-immune interactions and cancer therapy,” was supervised by Dr Rachid Ouifki (Pretoria University) and co-supervised by Prof Amina Eladdadi (College of St. Rose, New York, USA).



Khaphetsi Mahasa (left) with fellow graduates and Faculty members. Photo taken by Stefan Els.

Joseph Sempa graduated with a PhD in Epidemiology in the Faculty of Medicine and Health Sciences at Stellenbosch University. His dissertation, entitled “The effects of longitudinal HIV viral load exposure on Immune outcomes, Mortality, and Opportunistic infections in people on ART in sub-Saharan Africa,” was supervised by Prof Martin Nieuwoudt.



Joseph Sempa (left) with daughter Michaela and wife Doreen

Elizabeth Gonese graduated with a PhD in Epidemiology in the Faculty of Medicine and Health Sciences at Stellenbosch University. Her dissertation, entitled “Evaluation of the Mean Duration of Recent Infection (MDRI) and the False Recent Rate (FRR) for the Limiting Antigen Avidity Enzyme Immune Assay (LA_g) and Bio-Rad HIV 1/2 Plus O Avidity Incidence Assay (BRAI),” was supervised by Prof John Hargrove, Prof Jean Nachega, Dr Gert van Zyl and Dr Peter Kilmarx.



Elizabeth Gonese (right) celebrating her graduation

We congratulate our 2017 graduates and wish them all the very best for the future!

Arrivals & Departures



Dr Nick Ogden spent 4 months at SACEMA as the first SACEMA Fellow, a programme that was established to facilitate visits from senior international researchers. Dr. Ogden is a senior research scientist and Director of Public Health Risk Sciences division within the National Microbiology Laboratory of the Public Health Agency of Canada. His research focuses on assessing risk by studying the ecology, epidemiology, and genetic diversity of vectors and zoonotic and vector-borne micro-organisms, assessing impacts of climate change on zoonoses and vector-borne diseases, and developing tools for public health adaptation.

During his stay at SACEMA he facilitated the joint SACEMA-CIB Workshop on the practical integration of invasion biology and epidemiology, together with Dr Sabrina Kumschick of the Centre for Invasion Biology (CIB).



After successfully defending his PhD dissertation, **Dr Joseph Sempa** was appointed as a SACEMA Postdoctoral Fellow in November. He will be working with Dr Eduard Grebe and Prof Alex Welte on assessing HIV immunoassays to develop meaningful proxies for time-averaged viral load.

In December, SACEMA said goodbye to staff members **Ms Christianah Olojede** and **Prof Martin Nieuwoudt**. Ms Olojede joined the SACEMA staff in January 2017 as a part-time administrative assistant. Her cheerful countenance will certainly be missed! Prof Nieuwoudt joined the SACEMA staff as a Researcher in 2011. After being awarded seed funding from the University for the project, he has transitioned into a full-time position as Director of the new Institute for Biomedical Engineering.



INTERNATIONAL MEETINGS:

Measles modelling team holds workshop in Paris

SACEMA student James Azam and Director Juliet Pulliam attended a workshop on modelling alternative options for measles outbreak response vaccination in Paris on 13-14 November. Mr. Azam and Prof. Pulliam, along with Barbara Saitta (Médecins Sans Frontières, MSF), Kimberly Bonner (University of Minnesota), and Matt Ferrari (Pennsylvania State University) are members of the core modelling team working with MSF's Vaccine Working Group to investigate options for using measles vaccine in extended controlled temperature conditions, or outside the cold chain. The core group convened on 11 November to prepare for the meeting, which focused on development of detailed vaccination scenarios for incorporation into the modelling project. During the meeting, options for vaccination outside the current cold chain requirements were discussed based on experimental viability studies conducted by MSF in collaboration with the vaccine manufacturer, and various strategies for deployment of resources during a vaccination campaign were explored. On the second day of the workshop, groups developed a suite of operational plans for vaccine deployment matching the different vaccination scenarios that were considered viable.

The next task for the core modelling team will be to implement each of these plans within their measles modelling framework and assess the relative merits of the different vaccination options with regard to vaccination coverage achieved, time until target coverage is achieved, total resource investment required, cases prevented, and other metrics important to strategic decision-making for outbreak response measles vaccination in remote areas. Outside workshop, the group took some time to explore Paris (below).



Members of the core modelling team in front of Notre-Dame Cathedral in Paris. From left to right: Barbara Saitta, Kim Bonner, James Azam, Juliet Pulliam.

Epidemics 6

Three of SACEMA's staff attended and presented at the International Conference on Infectious Disease Dynamics (Epidemics 6), which was held on 29 November - 1 December 2017 in Sitges, Spain. SACEMA's Director, Juliet Pulliam, presented two posters on SACEMA's training activities; Deputy Director for Research, Wim Delva, presented two posters on model calibration for agent-based models; and Researcher Eduard Grebe presented work on estimating population-level HIV incidence in KwaZulu-Natal. Dr Grebe also presented a poster for Researcher Cari van Schalkwyk describing her work on the relationship between HIV and HPV transmission. In addition, Roxanne Beauclair, a SACEMA Research Associate, presented two posters on age-differences between sexual partners among adolescent girls in the Zomba District of Malawi and adults in Cape Town, respectively.

The conference provided numerous networking opportunities, including a chance for Dr Grebe to catch up with former visiting researcher to SACEMA and inctools contributor Yusuke Asai (Hokkaido University, Japan). A highlight of the conference was the reunion dinner held for alumni and faculty of the International Clinics on Infectious Disease Dynamics and Data (ICI3D) programme, on Wednesday evening. Sixteen alumni of the programme, which is SACEMA's flagship training initiative, attended the conference.



Group photograph taken at ICI3D alumni dinner

EVENTS:

Joint SACEMA-CIB Workshop: Practical integration of invasion biology and epidemiology

Changes to climate and biodiversity, combined with global social and economic changes and increasing movement of people and goods in a globalised world are increasingly facilitating species invasions.

Amongst these species are the disease-causing micro-organisms and parasites, and arthropod disease vectors, which cause or drive emerging infectious diseases such as Zika, Ebola, severe acute respiratory syndrome (SARS), and zoonotic influenzas. Recognising the similarity in drivers, biological processes and modelling approaches used in epidemiology and invasion biology, two of University of Stellenbosch's DST-NSF Centres of Excellence (SACEMA and the Centre for Invasion Biology [CIB]) held a joint workshop to identify possible synergies and opportunities for collaborations. The four day workshop comprised plenary talks by invited speakers, as well as breakout groups to explore particular invasive species or emerging infectious diseases. Participants included members of SACEMA and CIB, as well as invitees from South African animal health and public health organisations and other universities. Networking amongst the invitees was enhanced by social events including a workshop dinner and a hike on Stellenbosch mountain. The workshop was jointly facilitated by SACEMA Fellow Dr Nick Ogden and Dr Sabrina Kumschick of CIB. Outcomes of the workshop include a report for DST-NRF, a review article for a peer-reviewed journal (which is in preparation), and identification of areas for future collaboration between SACEMA and CIB.



Group photograph taken at the Joint SACEMA-CIB workshop

Introduction to R: Management, Exploration, and Communication of data

This five-day course took place from 23-27 October 2017, at the Stellenbosch Institute for Advanced Study (StIAS), adjacent to SACEMA. It was presented by Roxanne Beauclair, of SACEMA and the International Centre for Reproductive Health, Ghent University, Belgium, with the assistance of two course tutors, Gershom Buri and James Azam. The twenty-two participants included three from SACEMA, and others came from the International Livestock Research Institute, Kenya; Department of Agriculture, Northern Cape; Computational Biology Group at UCT, Institute of Infectious Disease and Molecular Medicine at UCT, National Institute for Communicable Diseases, Western Cape Government: Dept. of Health; South African Tuberculosis Vaccine Initiative, University of Cape Town, and University of Stellenbosch.

Participants' feedback showed a consensus that the content was excellent and coverage of topics within the time frame could hardly be improved. The very practical, hands-on nature of the course was greatly appreciated, and participants were shown how to go and find the theory for themselves. "In my opinion, the way this course is done should be some sort of standard way of doing things. The notes and comments inside the R scripts are clear and would allow me to continue with these tutorials completely independent of the practical component. The sessions with Roxy added value to the scripts since she was on-hand to ask questions when needed. She is very good at what she does and I would definitely recommend her as trainer." "This is literally the first time I had a clear idea of content as it was taught, then as it was implemented." Another edition of this course is scheduled for July 2018.



Group photograph taken of participants at the Introduction to R Short Course held in Stellenbosch, October 2017

Bayesian Biostatistics

Prof Emmanuel Lesaffre of the Leuven Biostatistics and Statistical Bioinformatics Centre (L-BioStat), Catholic University of Leuven, Belgium, presented this fourth edition of his five-day course, on 20-24 November 2017. The course was hosted by the Department of Statistics and Actuarial Sciences, University of Stellenbosch, in collaboration with SACEMA.

The class of 27 included 5 participants from SACEMA; others came from CDC South Africa, Medecins Sans Frontieres, Synexa Life Sciences, Durban University of Technology, North West University, University of Zululand, Nelson Mandela University, Rhodes University, University of the Western Cape, WITS, UNISA, and the Universities of Cape Town, Stellenbosch and KwaZulu-Natal. Many participants were enabled to attend thanks to funding sourced by Prof Paul Mostert from NRF for which we are grateful.

This intensive course, offering an introduction to relatively new and advanced methods which are increasingly widely used, is inevitably found challenging, with a lot of information and profound concepts to digest and understand in a few days. But participants rose to the challenge, and affirmed at the end that they would sustain their learning and would strongly recommend a future edition to their students and colleagues. Some quotes from participants' feedback: Emmanuel is a "world class presenter," "the depth of knowledge shared is rich;" "the practicals were really interesting and empowering;" there was a "good balance between theory and practical;" "this course was well taught, lots of important content, lots of interactions and practical examples with a thorough theoretical explanation too."



Group photograph of Bayesian Biostatistics course participants with Prof Emmanuel Lesaffre (front) and Paul Mostert

Clinic on Dynamical Approaches to Infectious Disease Data

The sixth annual Clinic on Dynamical Approaches to Infectious Disease Data (DAIDD), mounted in collaboration with the International Clinics on Infectious Disease Dynamics and Data (ICI3D) Program and hosted by the University of Georgia's Department of Epidemiology and Biostatistics, was held at the White Oak Conservation Center in Yulee, Florida, from 9-16 December 2017.

The clinic brought together graduate students and researchers, nine from Africa, thirteen from USA, and one from Jamaica, to learn about the conceptual foundations of dynamical modelling of infectious diseases, and to develop plans for research projects that incorporate a modelling component. The seven instructional faculty members included four North American collaborators, Rebecca Borchering (University of Florida), Jonathan Dushoff (McMaster University), Carl Pearson (US Africa Command), and Steve Bellan (University of Georgia), and three SACEMA staff and associates: Juliet Pulliam, John Hargrove, and Brian Williams. SACEMA's Assistant Director for Training, Gavin Hitchcock, served as Program Evaluator. The African side of the organising was done by Amanda October of SACEMA, working with Sara Ervin of the University of Georgia, the ICI3D Program Assistant.

Overall, DAIDD excelled in its usual unique features: the mix of participants (representing eighteen different institutions in ten countries), the variety of faculty, the exceptionally beautiful and hospitable venue, and the constant close interaction between student participants and faculty. With a whole week spent together, the informal bonding and the social times - coffee breaks, meals, meteor-shower watching on the golf course, bike rides, birding walks, game drive, playing mafia, etc -- were as important as the formal sessions, in providing in-depth professional mentoring and forging a community of younger researchers who will continue to interact in the future. Some quotes from participants: "I felt nothing but support from each member of the faculty, regardless of whom I've gone to, for as long as necessary." "I have discovered that the learning experience in use of modelling is more important than having an outcome to formally present at the end." "Confidence in being able to build a model is a great step in the right direction."



Group photograph of DAIDD 2017 participants and faculty, December 2017

Individual-based Modelling in Epidemiology: A Practical Introduction

From 13 to 17 November, the second edition of the course "Individual-based Modelling in Epidemiology" took place in the beautiful city of Antwerp, Belgium. The course was taught by Lander Willem and Wim Delva, and provided the 23 participants with a practical introduction to the design, implementation, analysis, and calibration of individual-based models.

Using the open access software packages NetLogo and R, tutorials revolved around model applications to study the epidemiology of HIV, influenza, and malaria.

As in the first edition of the course, earlier this year in Stellenbosch, participants were again asked to modify, extend, analyse, or calibrate one of the “classroom” models. According to preliminary feedback, these mini-projects were highly valued by participants, as they naturally require a great deal of hands-on practice for the two- or three-member project teams. Given the highly diverse set of backgrounds and skills that participants brought to the course, the mini-projects were not only an exercise in programming, but just as much an exercise in interdisciplinary communication in order to agree on a well-defined research question, an appropriate model world, an informative analysis of model output, and valid conclusions. The contagious enthusiasm of the participants, along with a the fantastic ghost walk along Antwerp’s most beautiful squares and alleys, made this course one to remember.



Lander Willem (second left) and Wim Delva (centre) with IBM course participants in Belgium

SACEMA Seminars

The following seminars were held between October and December:

- 13/10/2017: Prof Robin Wood (Desmond Tutu HIV centre): The aerobiology of TB transmission.
- 18/10/2017: Laurette Mhlanga (SACEMA PhD Student): Time/Age Smoothing/Interpolation of Prevalence Data to Optimise HIV Incidence Estimation from Population/Survey Data.

- 20/10/2017: Dr Jo Barnes: Drought and other disasters in the Western Cape - facing reality.
- 27/10/2017: Prof Wim Delva (SACEMA): Of individual-based models infectious disease epidemiology, and the data they are fitted to.
- 30/10/2017: Khaphetsi Mahasa (SACEMA PhD Student): Mathematical modelling of tumour-immune interactions and cancer therapy.
- 3/11/2017: Mr John Stover (Centre for Modelling, Planning & Analysis): Preparing global estimates of trends and needs for the HIV pandemic.
- 10/11/2017: Dr Chacha M. Issarow (Institute for Infectious Diseases and Molecular Medicine, UCT): Environmental and social factors impacting on epidemic and endemic tuberculosis: A modelling analysis.
- 15/11/2017: Katiso Ramolotja (SACEMA MSc Student): Modelling human immune response dynamics to Mycobacterium Tuberculosis infection.
- 17/11/2017: Prof Juliet Pulliam (SACEMA): Pattern and process: using models to improve population health.
- 22/11/2017: Prof John Hargrove (SACEMA): Estimating probabilities of extinction in environments with varying climate.
- 24/11/2016: Zinhle Mthombothi (SACEMA MSc Student): Modelling the effects of temperature change on the population dynamics of tsetse flies and trypanosomiasis transmission.

UPCOMING EVENTS:

Individual-based Modelling in Epidemiology: A Practical Introduction, 12-18 May 2018

Prof Wim Delva (SACEMA, Ghent University, and Hasselt University) and Dr Lander Willem (Antwerp University) will be presenting this intensive five-day course on Individual-based modelling in epidemiology, organised by SACEMA. The course, to be registered as a University of Stellenbosch Short Course, will run from 9 am to 4 pm daily, 14-18 May 2018, and be held at STIAS (adjacent to SACEMA) in Stellenbosch. The fee structure and registration form will be available [online](#) in early February.

Clinic on Meaningful Modeling of Epidemiological Data

The ninth annual Clinic on Meaningful Modelling of Epidemiological Data (MMED) will be held at AIMS South Africa on 28 May – June 8, 2018. MMED is part of the International Clinics on Infectious Disease Dynamics (ICI3D) Program, a collaboration between SACEMA and the University of Georgia's College of Public Health.

The MMED clinic is a two-week workshop that brings together junior researchers from North America and Africa, with the goal of engaging the participants in epidemiological modeling projects that use real data to grapple with practical questions in a meaningful way. Applications will be available in mid-January. Please check the ICI3D website for further information (www.ici3d.org/mmed).

Introduction to R: Management, Exploration, and Communication of data, 2-6 July 2018

The second edition of this intensive five-day course, will be presented by Roxanne Beauclair on 2-6 July 2018. The course, presented under the auspices of the South African DST-NRF Centre for Epidemiological Modelling and Analysis (SACEMA), will take place at the Stellenbosch Institute for Advanced Study (StIAS), from 9 am to 5 pm daily. More information will be available [online](#) at the end of January.

Advanced Epidemiological Methods Seminar, 30 July – 2 August 2018

Dr Matthew Fox of the Department of Epidemiology and the Center for Global Health and Development at Boston University will be presenting an intensive 4-day course on advanced epidemiological methods at Stellenbosch University under the auspices of the South African DST-NRF Centre for Epidemiological Modelling and Analysis (SACEMA), 30 July-2 August 2018. The course will take place from 9:00 am to 3:30 pm daily at StIAS, adjacent to SACEMA. The fee structure and registration form will be available [online](#) in early March.