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

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SACEMA NEWSLETTER

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NEWS:

SACEMA welcomes new Director

SACEMA welcomes Dr Juliet Pulliam who was appointed as the new CoE Director in July, taking over the reins from Alex Welte. She came to SACEMA from the University of Florida, where she spent five years as a faculty member in the Department of Biology and the Emerging Pathogens Institute (EPI). Since 2012, she has served as Program Director for the International Clinics on Infectious Disease Dynamics and Data (ICI3D, www.ici3d.org) Program, a collaboration between EPI and SACEMA.

Before moving to UF in 2011, Juliet spent three years as a Research and Policy for Infectious Disease Dynamics (RAPIDD) Program Fellow at the US National Institute of Health's Fogarty International Center and a year as a postdoctoral fellow at the Center for Disease Ecology at Emory University. She received a PhD in Ecology and Evolutionary Biology from Princeton University in 2007. Her research integrates principles from epidemiology and ecology to address fundamental and applied research questions related to the impact and control of infectious diseases.

We wish Dr Pulliam the very best in her new position.

How will Climate Change impact Trypanosomiasis?

SACEMA hosted a Tsetse and Trypanosomiasis Modelling Workshop in Stellenbosch from 27 June – 1 July 2016. At this Workshop, scientists from South Africa, other Africa countries, the UK and the USA shared knowledge of the problems and prospects associated with modelling the population dynamics of tsetse flies (*Glossina* spp) and the trypanosomes that they transmit in Africa to game animals, domestic livestock, and humans. The Workshop was funded through the WHO/TDR/IDRC programme: "*Human African Trypanosomiasis: alleviating the effects of climate change through understanding human-vector-parasite interactions*". There was, accordingly, considerable emphasis on the effects of climate change on the population dynamics of the vectors and the parasites. More importantly the Workshop considered how climate change might impact vector and disease distribution and how, particularly, this would affect potentially vulnerable farmers and livestock keepers living in contact with tsetse-infested areas. The event was a "*Workshop*" in the true sense of the word, with half of the second day, and large proportions of the last three days, being given over to Break-Out sessions where the participants formed *ad hoc* groups to work on problems of mutual interest. This provided the particularly important opportunity for the four graduate student attendees to interact with each of the more senior researchers.

The centrality of climate to the proceedings was emphasised by analysis of data from Zimbabwe, where meteorological records have been produced almost continuously over the past 57 years. Mean daily maximum and minimum temperature have increased by 0.9°C and 1.7°C, respectively, since 1959, with the biggest increases in November, at the end of the hot dry season. These temperature increases, and some extreme events, have been associated with declines of 80-98% in the tsetse populations around Rekomitjie. Dr Glyn Vale's simulation studies produce results consistent with temperature-dependent increases in mortality among adult and, particularly, immature tsetse – resulting in the severe declines in tsetse populations already observed at Rekomitjie. It was suggested that the further increases in temperatures predicted for the next few decades will cause the tsetse populations at Rekomitjie to disappear, with *G. pallidipes* going before *G. m. morsitans*. Conversely, the climate on higher ground in Zimbabwe will become more suitable for tsetse, and there is a concern that this could result in further outbreaks of human trypanosomiasis in these areas.

Tsetse and Trypanosomiasis Modelling Workshop, Stellenbosch, June 2016

Graduations 2015/2016

Congratulations to the following SACEMA-funded students who graduated in 2015/2016:

Nada Abdelatif graduated with an MSc in Statistics from the University of KwaZulu-Natal. Her thesis titled "The Modelling of African Animal Trypanosomiasis in Kwazulu-Natal, South Africa" was supervised by Prof Henry Mwambi and Dr Faraimunashe Chirove.

Maynard Meiring graduated with an MSc in Mathematical Sciences from Stellenbosch University. His thesis titled "Modelling of the Invasion Dynamics of *Plasmodium falciparum* Merozoites into Red Blood Cells" was supervised by Prof Jacky Snoep and Dr Dawie van Niekerk.

Rendani Netshikweta graduated with an MSc in Applied Mathematics from the University of Venda. His thesis titled "A Mathematical Modelling Frame-work for Immmuno-epidemiology of Guinea Worm Infection" was supervised by Prof Winston Garira and Prof S Moyo.

Farzana Osman graduated with an MSc in Statistics from the University of KwaZulu-Natal. Her thesis titled "Statistical Analysis of the Attitudes Towards Blood Donation and Transformation in Mali" was supervised by Prof Delia North and Prof Temesgen Zewotir.

Danielle Roberts also graduated with an MSc in Statistics from the University of KwaZulu-Natal. Her thesis titled "Prevalence and Risk Factors of Malaria in Children under the Age of Five Years Old in Uganda" was supervised by Prof Glenda Matthews.

Andrea Scholtz graduated with an MSc in Applied Mathematics from North-West University. His thesis titled “Modelling the transmission of pathogens by considering environmental- and direct transmission mechanisms” was supervised by Prof IM Schoeman and Prof J Spoelstra.

Rashmika Singh graduated *cum laude* with an MSc in Statistics from the University of KwaZulu-Natal. Her thesis titled “Sexual debut: An Analysis of the Birth to Twenty Data” was supervised by Prof Glenda Matthews and Mr Jordache Ramjith.

Hloniphile Sithole also graduated with an MSc in Statistics from the University of KwaZulu-Natal. Her thesis titled “Mathematical Analysis of Tuberculosis Vaccine Models and Control Strategies” was supervised by Prof P Sibanda and Prof H Mwambi.

Renier van Rooyen graduated with an MSc from Stellenbosch University. His thesis titled “Compounding a Class of Rayleigh Distributions: An Objective Bayesian Approach” was supervised by Prof Paul Mostert.

Bewketu Bekele graduated with a PhD in Mathematical Sciences from Stellenbosch University. His dissertation titled “Modelling the Impact of Early HIV Treatment on the HIV Epidemic in South Africa” was supervised by Dr Rachid Ouifki, Prof Wim Delva, and Prof Farai Nyabadza.

Eben du Toit graduated with a PhD in Electronic Engineering from the University of Pretoria. His dissertation titled “Pinning Control of Disease Networks” was supervised by Prof Ian Craig.

Muna Balla Elshareef Mohammed graduated with a PhD in Statistics from the University of KwaZulu-Natal. Her dissertation titled "Statistical Methods to Evaluate Disease Outcome Diagnostic Accuracy of Multiple Biomarkers with Application to HIV and TB research" was supervised by Prof Henry Mwambi.

New faces at SACEMA

SACEMA welcomed the following new students to the Wine Cellar:

Zinhle Emily Mthombothi is an MSc student at Stellenbosch University (SACEMA), working with Dr Rachid Ouifki and Prof John Hargrove on her project, "Studying the effects of temperature change on the dynamics of tsetse flies and trypanosomiasis disease transmission". In 2015 she obtained a Structured Master's degree in Mathematical Sciences at the African Institute for Mathematical Sciences South Africa (AIMS-SA). She also holds a BSc degree in Mathematics and Chemistry, and a BSc Honours degree in Mathematics, both from Rhodes University in the years 2013 and 2014 respectively.

Wanja Chabaari hails from Kenya and is currently pursuing her Master's degree in Mathematics at Stellenbosch University. She holds a BSc in Applied Mathematics and Computer Science and an Honours in Bio-Mathematics. She is based at the Centre full time under the supervision of Dr Ouifki and Dr Eladaddi. Her research focuses on the use of oncolytic viruses as a novel treatment for cancer.

James Azam obtained his undergraduate degree in Actuarial Science from the Kwame Nkrumah University of Science and Technology in Ghana. He then proceeded to the African Institute for Mathematical Sciences (AIMS) centre in Senegal where he pursued his Master's degree and was awarded a Very Good Pass. He achieved a distinction in his thesis titled, "Hedging Conditional Value at Risk". He is currently at SACEMA, Stellenbosch University, pursuing a research Master's degree in Mathematics. He is modelling interventions to ascertain the possible eradication of hepatitis B from sub-Saharan Africa. His research interests lie in vertically transmitted diseases and intervention modelling.

Kagiso Ramolotja received a BSc in Mathematics and Statistics at the University of Limpopo, and an honours degree through the African Institute for Mathematical Sciences (AIMS) and Stellenbosch University (SU). He is currently a Master's student under the supervision of Dr Gaston Mazandu and Prof Farai Nyabadza. His research interest lies in Tuberculosis and his project title is "A systems Analysis of Tuberculosis Drug-Target Disease Associations for Therapeutic Purposes, Using Functional Networks and Mathematical Model".

Frieda Geldenhuys is an MSc student at Stellenbosch University (SACEMA), working with Prof Cang Hui and Prof Martin Nieuwoudt on establishing a sustainable management plan for the African penguin (*Spheniscus demersus*) species colony.

Evans Omondi was born and raised in Kenya. He received a BSc in Applied Statistics with Computing, from the University of Eldoret in Kenya in 2013. He is a Master's student at SACEMA, University of Stellenbosch working on a mathematical model for the treatment of onchocerciasis with ivermectin. His thesis project is being supervised by Prof Farai Nyabadza. Prior to joining the Master's programme at SACEMA, Evans was a student at AIMS-South Africa and graduated with a Structured Master's in Mathematical Sciences in 2015.

Steve Cygu is a Master's student working under the supervision of Prof Martin Nieuwoudt and Prof Cang Hui on establishing appropriate models for age-related changes in lymphocyte cell markers in paediatric data from South Africa.

INTERNATIONAL MEETINGS:

SACEMA Master's student, Tokpa Jamah participated in the first Next Einstein Forum (NEF) Global Gathering as an ambassador for his country (Liberia). The conference themed "Connecting Science to Humanity" was held over three days from 8th to 10th March in Dakar, Senegal. More than 1000 people representing the scientific community, industry, civil society, media, and decision-makers from across the world, especially from Africa participated in the conference. Tokpa writes, "My expectations at this global multi-culture event were enormous and diverse, ranging from in-depth academic engagement to social networking opportunities. I was also able to discover some of the major challenges facing the advancement of Science education in other countries across Africa, and possible ways forward, and was able to build a strong and good network with other senior, junior and young researchers from across the continent and the world at large, which could create the necessary space for professional development in my research career".

Christianah Olojede participated in the Statistics and Data Science in Industry workshop, co-hosted by the Department of Statistical Sciences at the University of Cape Town and the African Institute for Mathematical Sciences (AIMS). The event was held at the AIMS campus in Muizenberg, Cape Town from the 18th to the 23rd of January 2016. It involved groups of students solving real-world problems, which were submitted by industry partners and solved under the supervision and guidance of leading experts in the field. There were five real-world problems submitted by industry partners in Banking, Ecology, Online marketing, Cosmology, and Bioinformatics. Christianah writes "I was in the Bioinformatics group and we worked on a topic titled "Collapsing viral next generation sequencing data" where techniques like multidimensional scaling analysis, principal component analysis and cluster analysis were used on genomics data in R statistical software and Python. We had presentations on our projects per group and new skills were learnt in the process".

INTERNATIONAL EXCHANGE PROGRAMMES:

International Disease Dynamics and Data Research Scholars Exchange Program (I3D)

The International Disease Dynamics and Data Research Scholars Exchange Program (I3D) provides former ICI3D clinic participants the opportunity to do a 6-week research exchange abroad.

Florian Marx, a Postdoctoral Fellow in Epidemiology of Microbial Diseases at the Yale School of Public Health, visited SACEMA for February and part of March, when he went on to spend some days in Geneva with his I3D faculty supervisor, Brian Williams. Florian also worked with Nulda Beyers, of the Desmond Tutu TB Centre, during his visit. In Florian's words: "I feel that this research exchange has been an invaluable experience for me, scientifically and personally. I used my time to develop scenarios for targeted interventions,

specifically for active TB case finding and secondary preventive therapy among individuals previously treated for TB. I further collected data about resources needed for and costs associated with implementing these interventions. Finally, I conducted an analysis about the performance of WHO-recommended algorithms of screening for active TB among individuals with and without previous TB treatment using available data... An important aspect of my visit was the exchange with researchers and students at SACEMA. I am grateful for thoughts and feedback they provided at both my presentations and during various discussions." Brian Williams' writes: "Florian has shown beyond doubt that TB is an inherently relapsing disease. This has vital consequences for how one goes about controlling TB and should, in my opinion lead to a substantial change in the way in which we control TB in the world. Further studies of the immunology, physiology and sociology of TB are now needed to better understand the processes that underlie these high rates of relapse and reinfection and Florian has already developed some important ideas on how to explore these further questions."

Avery McIntosh, a doctoral student at Boston University School of Public Health, visited SACEMA in April-May, working with Alex Welte and others. Avery writes: "The goal of my exchange was to help steward the creation of software tools in the R computing environment for what has been loosely called 'The ABIE Project' -- a longstanding research initiative to develop tools and methods and a theoretical underpinning for alternative techniques of HIV incidence estimation." Based on the work of Alex Welte, Reshma Kassanjee and others, with inspiration and a methodological springboard taken from the already developed ABIE spreadsheets tools, Avery built R functions to calculate power, sample size, precision, and to test statistical hypotheses arising from the earlier work. He also recorded some theoretical results previously not published on the formulas for variance of incidence difference statistics and for a novel empirical bootstrap method devised by Alex, and wrote long form examples for the function implementation for future users. He co-authored an abstract submission to the International AIDS Society's 2016 conference in Durban, and contributed to the design, validation, and documentation of the final R package, titled *inctools,* now available on the CRAN network. (CRAN is an online hub of file hosting platforms for user-created modules for the R environment. In the first two weeks after release of the package, 74 users downloaded the software.) Alex Welte writes: "Avery's contribution was timely and substantial." Back to Avery: "I wish to thank Dr. Alex Welte and the entire I3D and SACEMA team for the opportunity to work on such an important and fascinating project. I had a challenging, productive, and inspiring trip. This exchange has furthered my education in statistics and programming, and given me insight into the process of working on a collaborative international long-term research project—an invaluable personal and professional experience. I am truly grateful for the support and mentorship of the entire I3D exchange team."


Jennifer Lord (centre) with Gavin Hitchcock and John Hargrove

Jennifer Lord, from Liverpool School of Tropical Medicine and University of Florida, visited June-July, attending the MMED Clinic first, and then working with John Hargrove at SACEMA on a number of projects related to tsetse fly populations and trypanosomiasis. She writes: "My I3D-funded project is entitled 'The hunger game: simulating savannah tsetse population dynamics including starvation-dependent mortality.' The project has given me opportunity to implement the skills I learned during MMED - particularly approaches and methods for fitting models to data. The work done during the project will form the basis for my first manuscript involving the use of mathematical modelling to address a biological question. I hope to build on my modelling experience when I return to LSTM-continuing to apply the skills I've learned to my current project concerning the transmission of trypanosomes on the borders of protected areas in Tanzania".


Roxanne Beauclair with Jonathan Dushoff

SACEMA researcher, Roxanne Beauclair, participated in the program from 12 April to 24 May 2016. The exchange brought Roxanne to McMaster University in Hamilton, Ontario to work with Prof Jonathan Dushoff in the Theoretical Biology Lab. During the visit she commenced work on a project entitled, 'Describing the age-mixing pattern and sexual behaviours in trial arms of the Zomba Cash Transfer Programme'. Roxanne elaborated, "My visit to McMaster was an amazing opportunity and a fruitful visit. I was very appreciative of this opportunity, especially having access to Jonathan's time and expertise. By the end of the trip, I felt as though I was one of the regular students in Dushoff's Lab. Importantly, I feel like I walked away with a brand new perspective on how to tackle an analysis plan in strictly scientific way". This project is still ongoing and will ultimately feature in Roxanne's PhD dissertation.

EVENTS:

Bayesian Biostatistics, 4-8 April 2016

Prof. Emmanuel Lesaffre of the Leuven Biostatistics and Statistical Bioinformatics Centre (L-BioStat), Catholic University of Leuven, Belgium, presented this third edition of his five-day course. The course took place at the Stellenbosch Institute for Advanced Study (STIAS). The class of 22 included 14 participants from SACEMA, and others from Rhodes University, the University of Venda, the Centre For Evidence-Based Health Care at Stellenbosch University, the School of Statistics and Actuarial Science at University of Johannesburg, the Centers for Disease Control & Prevention (CDC) Malawi,

the Namibia Ministry of Health and Social Services, and the South African Medical Research Council (MRC) Burden of Disease Research Unit.

Bayesian Biostatics course, Stellenbosch, April 2016

SACEMA Research Days 2016

The annual 'Research Days' meeting in Stellenbosch, to which all SACEMA funded students and their supervisors are invited, was this year extended to a four day training and research event, 11-14 April 2016. The first day kicked off with a keynote talk by Ian-Malcolm Rijsdijk on *Media, Science and Publics,* followed by four training workshops, of which participants could do one (if they chose the public speaking workshop) or two (of the others).

Speaking confidently in public, was led by Vicky Davis; *Ethics, Writing and Talking about What you Know,* was led by Ian-Malcolm Rijsdijk; *Developing and Maintaining a Good CV / Resume,* was led by Alex Welte; and *Scientific literature search & management skills*, was led by Wim Delva. The remaining three days consisted of student research presentations, with some senior speakers, and three keynotes. The Minister of Health, Dr Aaron Motsoaledi, had to cancel his keynote, due to an emergency cabinet meeting, and Alex Welte stepped in, and spoke on: *Basic Calculus in Epidemiological Surveillance: Still Cutting Edge 300 Years Later.* Other keynotes were: Dr Natasha Palesa Mothapo: *From Alex to the world: an odyssey in pursuit of a career in science*; and Dr Makobetsa Khati, of the National Research Foundation; *Growing the next generation of researchers: the NRF perspective* , and Wim Delva: *Mind the age gap: Age-mixing patterns predict HIV incidence.*

Twenty-seven SACEMA funded students (13 PhD and 14 Masters) gave talks on their work-in-progress, and engaged in discussions with SACEMA's trade-mark friendly-though-critical audience. The meeting provided a perfect opportunity to receive constructive critique and stimulation in a friendly environment, and for developing core skills for emerging researchers. It also provided an opportunity for students to get to know each other, meet fellow researchers, foster collaborations,

and introduce new students and their supervisors to SACEMA and the scope of its work. Once again an expert consultant, Dr Jo Barnes, was commissioned to attend and report on individual presentations as well as on the overall relevance and quality of the work, from an epidemiologist's point of view.

SACEMA Research Days, Stellenbosch, April 2016

MMED, 30 May - 11 June 2016,

The 7th annual Clinic on the Meaningful Modeling of Epidemiological Data (MMED), took place at AIMS in Muizenberg. The Clinic brings together African and American student participants from diverse disciplinary backgrounds, for training in collaborative multidisciplinary modelling, and is organized jointly by a consortium of North American faculty and SACEMA faculty, with the ICI3D Program assistant, Rebecca Borchering, handling the overall logistical preparations, and AIMS and SACEMA jointly handling the local logistics. Participants included:

- 12 AIMS MedPH students, doing the course Mathematical Modeling in Medicine and Public Health (MedPH) as part of their AIMS Structured Masters;
- 6 AIMS/SU Biomathematics Honours students, also doing the MedPH course;
- 8 American students;
- 23 African students, from many countries, including South Africa, Zimbabwe, Malawi, Ghana, Cameroon, Uganda and Kenya;
- 10 faculty: Steve Bellan, Rebecca Borchering, Cara Brook, Faikah Bruce, Wim Delva, Jonathan Dushoff, John Hargrove, Calistus Ngonghala, Travis Porco, Juliet Pulliam, Alex Welte, Brian Williams
- 3 alumni mentors: Samuel Iddi of University of Ghana, and Cari van Schalkwyk & Zinthle Mthombothi of SACEMA;
- 1 evaluator: Gavin Hitchcock & 1 faculty observer: Wilfred Ndifon.

MMED 2016, Muizenberg, June 2016

Using quantitative bias methods with epidemiological data, 18-20 May 2016

Dr Matthew Fox, of the Department of Epidemiology and the Center for Global Health and Development at Boston University, has visited SACEMA annually since 2010. For the first four years he presented his course on Advanced Methods in Epidemiology, and since 2014 we have alternated this with another vibrant string to Matt's bow -- his course on quantitative bias analysis, providing powerful tools which allow investigators to go beyond mere speculation about bias. Participants receive a copy of the book by Lash, Fox, and Fink: *Applying Quantitative Bias Analysis to Epidemiologic Data* (Springer 2009). This second edition of the course drew 20 participants. We look forward to seeing Matt back next year to give either the Advanced Methods in Epidemiology or Quantitative Bias course.

Quantitative Bias course, Stellenbosch, May 2016

SACEMA Seminars

The following seminars were held between January and July:

27th January: Petra Bäumler, SACEMA intern and PhD student at the Multidisciplinary Pain Center, Department of Anaesthesiology, University of Munich: Pain and acupuncture research at the Multidisciplinary Pain Center, Department of Anaesthesiology, University of Munich

10th February: Christianah Olojede, SACEMA MSc student: Partner turnover rate and the lifetime number of sexual partners in Cape Town

15th February: Kevin Hansen, Zimbabwean actor/drama teacher/director/musician, theatre-improv expert, Edinburgh Fringe Theatre veteran and HIFA star: Communication/presentational skills for public speaking

17th February: Tokpa Darwolo Jamah Jr, SACEMA MSc student: Modelling the economics of trypanocides and insecticide-treated cattle interventions against trypanosomiasis disease within a multi-host population

24th February: Fanuel Omondi Otieno, SACEMA MSc student: Intimate partner violence and age disparity: a multi-country analysis

26th February: Robert Smith?, University of Ottawa: Adding education to "test and treat": Can we overcome drug resistance?

1st March: Roxanne Beauclair, SACEMA research associate: Goal-oriented workflow using RStudio

7th March: Florian Marx, Postdoctoral Fellow in the Department of Epidemiology of Microbial Diseases at Yale School of Public Health, and I3D research exchange visitor: Design and costs of TB interventions targeted to previously treated people

9th March: Joseph Sempa, SACEMA PhD student: Standardization of statistical immune response models for patients on antiretroviral therapy in sub-Saharan Africa: Towards a meta-model

16th March: Steve Bicko Cygu, SACEMA MSc student: Establishing appropriate models for age-related changes in lymphocyte cell markers in paediatric data from South Africa

30th March: Eva Ujeneza, SACEMA PhD student: Modelling long term immune outcome (CD4+) in HIV infected patients on ART

1st April: Wim Delva, SACEMA researcher: Mind the age gap: Age-mixing patterns predict HIV incidence

21st April: Avery McIntosh, PhD candidate in Biostatistics at Boston University School of Public Health and I3D research exchange visitor: Bayesian extensions to generalized linear mixed effects models for household tuberculosis transmission

28th April: Avery McIntosh, PhD candidate in Biostatistics at Boston University School of Public Health and I3D research exchange visitor: Mapping the spatio-temporal distribution of multidrug-resistant Tuberculosis in Western Cape, South Africa

3rd May: Avery McIntosh, PhD candidate in Biostatistics at Boston University School of Public Health and I3D research exchange visitor: I3D Exchange visit final presentation: How to build an R package

24th June: Rebecca Borchering, PhD candidate in the Mathematics Department at the University of Florida in the United States: Impact of resource abundance on pathogen invasion risk

8th July: Jessica Metcalf, Assistant Professor of Ecology, Evolutionary Biology & Public Affairs at Princeton University: Modeling to inform introduction of rubella-containing vaccine

8th July: Amy Wesolowski, postdoctoral fellow at Princeton University and Harvard TH Chan School of Public Health: The role of human travel on infectious disease dynamics

29th July: Jennifer Lord, postdoctoral fellow at Liverpool School of Tropical Medicine and I3D research exchange visitor: I3D Exchange Program Project. The hunger game: simulating tsetse population dynamics including starvation-dependent mortality

UPCOMING EVENTS:

Bayesian Methods in Longitudinal Studies: 24-28 October 2016

Prof Emmanuel Lesaffre of the Leuven Biostatistics and Statistical Bioinformatics Centre (L-BioStat), Catholic University of Leuven, Belgium, will be presenting this five-day course in Stellenbosch from 24-28 October 2016. More information will be available on our website shortly.

Call for SACEMA Internal Bursaries for 2017: Deadline 19 September 2016

SACEMA invites applications for bursaries to study towards MSc or PhD degrees, based at and supervised through SACEMA, in fields relating to epidemiological modelling and biostatistics. A background in quantitative methods is required, and interdisciplinary experience is welcome. Previous exposure to SACEMA's core research areas will be an advantage, and priority will be given to applicants demonstrating high motivation and affinities for the areas in which SACEMA's current projects lie. For more information, go to http://sacema.com/node/call-for-sacema-internal-bursaries-for-2017.

Call for SACEMA External Bursaries for 2017: Deadline 17 October 2016

SACEMA invites applications for bursaries to study towards MSc or PhD degrees, based at and supervised from any institution in South Africa, in fields relating to epidemiological modelling and biostatistics. A background in quantitative methods is required, and interdisciplinary experience is welcome. Previous exposure to SACEMA's core research areas will be an advantage, and priority will be given to applicants demonstrating high motivation and affinities for the areas in which SACEMA's current projects lie. For more information, go to http://sacema.com/node/call-for-sacema-external-bursaries-for-2017.