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SACEMA NEWSLETTER

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NEWS:

Cape Town Sexual Behaviour Survey results showcase held on 27 March

The results from a SACEMA survey on sexual behaviour dynamics in three urban areas of Cape Town with a high prevalence of HIV were made public on Friday 27 March 2015 at a free, open event in Khayelitsha. It was well attended with approximately 250 people present. Members of the community could come, eat a snack, enjoy music played by a local DJ, peruse pamphlets, and listen to speakers, including the principle investigator, Dr Wim Delva and Shiela Mc Cloen, Deputy Director of comprehensive health programmes in Khayelitsha.

The survey involved 878 participants, as well as in-depth semi-structured interviews with 23 participants from the same communities in 2011 and 2012. The results were analysed in collaboration with researchers from Ghent University and Hasselt University in Belgium. Dr Wim Delva, principal investigator and deputy-director of SACEMA, says the objective of the study was to describe relationship characteristics, which have previously been identified as risk factors for the transmission and acquisition of HIV.

“Although many studies into sexual risk behaviours have been conducted in South Africa, our survey is unique in that we used touch screen computers and a visual time line to reconstruct the last year of participants’ sexual relationship history. In this way we were able to study sensitive behaviours such as engaging in multiple concurrent relationships without having to ask questions about concurrency directly,” Dr Delva remarks.

Ms Roxanne Beauclair, study coordinator and PhD candidate, thinks it is the duty of researchers to let the public know what is found and to help aid in the correct interpretation of the results.

“Even though the event was an open-house, it was a pleasure to see that so many of the attendees from the community stayed to listen to all the speakers. To me it demonstrates that residents in Khayelitsha are hungry for information and they take a general interest in what researchers have to say,” she adds.



Wim Delva addresses the community at the Sexual Behaviour results showcase held in Khayelitsha in March 2015

Spreading the gospel of dynamical modelling of infectious diseases

The latest (6th) edition of the **Oxford Textbook of Global Public Health** -- advertised as the 'ultimate reference' on public health, was finally published in March this year. Alex Welte, SACEMA's Director, was commissioned in 2012 to produce the chapter on mathematical modelling of infectious diseases. Together with co-authors Brian Williams and Gavin Hitchcock, Alex wrote an innovative chapter that seeks to demystify mathematical modelling, including some very simple examples. The chapter not only clarifies what modelling is and what questions it is especially fit to answer, but demonstrates how it has been and is being used successfully, to interpret epidemiological trends, project trends into the future, and offer solid evidence for the guidance of public health policy-makers. The chapter closes with some often neglected principles of good modelling practice, designed to optimise the real-world benefits of modelling and facilitate fruitful conversation with (and between) modellers.

Alex Welte, Brian Williams, and Gavin Hitchcock, **Mathematical models of transmission and control of infectious agents**, Chapter 5.18, in **Oxford Textbook of Global Public Health** (Sixth Edition). Edited by Roger Detels, Martin Gulliford, Quarraisha Abdool Karim, and Chorh Chuan Tan. Oxford University Press (February 2015). Print ISBN-13: 9780199661756.

<http://oxfordmedicine.com/view/10.1093/med/9780199661756.001.0001/med-9780199661756>

Also in March 2015, a seminal review article, with similar message and target audience, appeared in the prestigious journal **Science**. A cooperative effort by some of the leaders in the field (including Hans Heesterbeek, Roy Anderson, and SACEMA's close collaborator on MMED and DAIDD Clinics, Juliet Pulliam), this paper developed out of a program on Infectious Disease Dynamics at the Isaac Newton Institute for Mathematical Sciences, Cambridge, UK, Aug/Sep 2013 and May/June 2014.

From the editor's summary: The spread of infectious diseases can be unpredictable. With the emergence of antibiotic resistance and worrying new viruses, and with ambitious plans for global eradication of polio and the elimination of malaria, the stakes have never been higher. Anticipation and measurement of the multiple factors involved in infectious disease can be greatly assisted by mathematical methods. In particular, modeling techniques can help to compensate for imperfect knowledge, gathered from large populations and under difficult prevailing circumstances. Heesterbeek et al. review the development of mathematical models used in epidemiology and how these can be harnessed to develop successful control strategies and inform public health policy.

Hans Heesterbeek, et al. **Modeling infectious disease dynamics in the complex landscape of global health**, *Science*, 13 March 2015: Vol. 347 no. 6227

<http://www.sciencemag.org/content/347/6227/aaa4339>

SACEMA hosted Malaria workshop

On Wednesday morning, 22 April, a group of malaria researchers gathered at SACEMA for a 3-day workshop organised around the long-planned visit by Bob Snow of KEMRI in Kenya. Though based in Kenya, Bob is Professor of Tropical Public Health at the Centre for Tropical Medicine, Nuffield Department of Medicine, University of Oxford; he is also Chairman of the Malaria Public Health Department of the KEMRI-Wellcome Trust - University of Oxford Collaborative Programme in Kenya. Other visitors were Danielle Roberts, Benn Sartorius and Dawit Ayele from UKZN, and Abdulaziz Mukhtar from UWC. Local participants were Alex Welte, Jacky Snoep, Rachid Ouifki, Jalene van Zyl, Maynard Meiring, Kathleen Green, and Christianah Olojede. In addition to meeting with smaller groups and individuals, Bob gave some plenary sessions on the overall story and challenge of malaria in Africa, and all SACEMA staff and students were invited to attend sessions of interest. We expect ongoing collaborations with Danielle and Benn at UKZN, and with Abdulaziz and his supervisor Dr Justin Munyakazi at UWC, and there is hope that Bob may return for a more extended visit.

We asked Jalene van Zyl for her impressions of the workshop:

Recently a Snow-sledge loaded with an energetic and inspirational malaria expert called Bob slid into the lives of SACEMA staff and students. Reminiscent of John Snow (the pioneer epidemiologist who discovered the cause of the 1854 cholera epidemic in London) this passionate and compassionate epidemiologist was born in the UK, but has worked in the field in Africa since 1984. Bob shared with us his expertise on the complex epidemiology of malaria parasite exposure, clinical disease outcomes, and various approaches to reducing the malaria burden in Africa. It became evident to me that the many diverse African environments pose their unique challenges, in regard to control of malaria prevalence, incidence and transmission. In other words, one model does not fit all settings. This poses a big problem for the design, implementation and monitoring of long-term, cost effective malaria control strategies.

Due to budget constraints, all malaria cases simply cannot be recorded and treated, so that missing data is a pressing problem. Bob Snow has taken on the challenge of using a Bayesian approach with geostatistical models to fill in missing data based on surrounding areas for which data have been recorded.

Such uncertainty maps may also be used to generate motivation to collect data from areas that are estimated to pose greater threat. The clinical disease profiles of malaria infected patients are different for settings with different forces of infection or risk factors at play.

We warmly thank Bob Snow for so willingly sharing with us his enlightening and inspiring approach to malaria, and his many years of experience in the field.



Benn Sartorius, Bob Snow, Danielle Roberts and Dawit Ayele at the Malaria Workshop held at SACEMA in April 2015.

TB Modelling workshop, 9-10 March

SACEMA and the Desmond Tutu TB Centre co-hosted a 2-day TB Modelling workshop in Stellenbosch from 9-10 March 2015. The workshop, held in the Library at the StIAS Manor House was aimed at addressing amongst others the gaps in TB modelling, reviewing and improving existing models, and identifying opportunities for further collaboration. Local participants included Alex Welte, Sandile Ginindza, Brian Williams, Roger Ying and Cari van Schalkwyk from SACEMA as well as Mariana Kruger and Ute Feucht from the Department of Paediatrics and Pren Naidoo, Rory Dunbar, Nulda Beyers, Susan van Wyk, Mareli Claassens and Dewald van Deventer from the Desmond Tutu TB Centre. International participants were Ivor Langley (Liverpool, UK), Florian Marx and Ted Cohen (Boston, USA) and Hsien-Ho Lin (Taiwan).

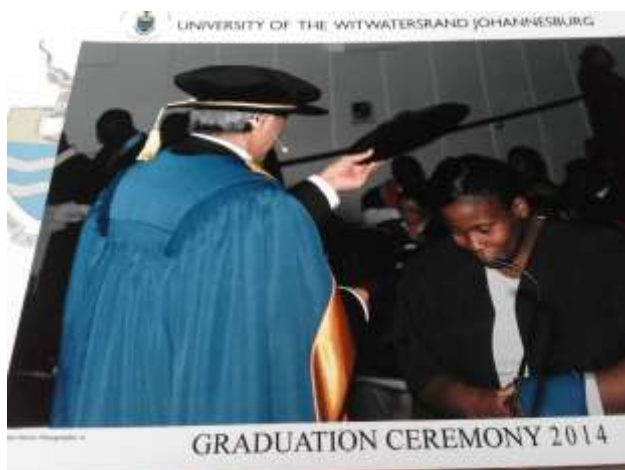
Graduations 2014/2015

Congratulations to the following SACEMA-funded students who graduated in 2014/2015:



Eddy Kimba Phongi graduated with a PhD in Applied Mathematics from the University of KwaZulu-Natal. His thesis titled “Invariant Manifolds of Infinite-Dimensional Dynamical Systems with Applications” was supervised by Prof Jacek Banasiak.

Marisa Klopper graduated with a PhD in Molecular Biology from the University of Stellenbosch. Her thesis titled “Molecular characterization of the drug-resistant tuberculosis epidemic in the Eastern Cape, South Africa” was supervised by Prof Tommie Victor and co-supervised by Prof Rob Warren and Dr Lizma Streicher.



Simangaliso Chitunhu graduated with a Masters in Epidemiology and Biostatistics from the University of the Witwatersrand. Her thesis titled "Determinants of malaria episodes in children under 5 in Malawi in 2012" was supervised by Dr Eustasius Musenge.

Roux-Cil Ferreira graduated with a Masters in Statistics from Stellenbosch University. Her thesis titled “An individual-based model of tsetse fly population dynamics: modelling an extensive mark-release-recapture experiment” was supervised by Profs John Hargrove and Sarel Steel.



Mbhekiseni Khumalo graduated with a Masters in Epidemiology and Biostatistics from the University of the Witwatersrand. His thesis titled “Correlation between surrounding climatic or environmental conditions and malaria incidence in selected sub-districts of Mpumalanga Province, South Africa (2001 – 2010)” was supervised by Profs Maureen Coetzee and Benn Sartorius.

New faces at SACEMA

SACEMA welcomed the following new staff and students to the wine cellar:



Trust Chibawara has been appointed as a Research Fellow and his main focus is on HIV incidence estimation. He holds a BSc Honours Degree in Mathematics from Midlands State University, a postgraduate diploma from AIMS in partnership with UCT and a Master's Degree in Financial Mathematics from the University of Stellenbosch. Prior to joining SACEMA he was the Operations Associate/Business Operation Analyst of the African Institute for Mathematical Sciences - Next Einstein Initiative (AIMS-NEI) where he supported the startup and establishment of new AIMS centres and the AIMS-NEI secretariat.

Eduard Grebe is a postdoctoral research fellow working on the CEPHIA (Consortium for the Evaluation and Performance of HIV Incidence Assays) project under the supervision of Prof Alex Welte. His background is in Economics and Philosophy with his previous research focusing on the HIV/AIDS response in Africa.



Olina Ngwenya has been appointed as a Researcher. She holds a Master's Degree in Statistics from the University of KwaZulu-Natal as well as a Master's Degree in Biostatistics from Hasselt University in Belgium. Olina's current research focuses on two projects: Hepatitis B and PMTCT.

Christianah Oyindamola Olojede is an MSc student. She has an undergraduate degree in Statistics from the Ladole Akintola University of Technology (LAUTECH), Ogbomoso, Oyo State, Nigeria. She also has Master's Degree in Mathematical Sciences from AIMS-Senegal. Christianah is currently working on an aspect of sexual contact network with the project titled "Partner turnover rates and the number of lifetime partners in Cape town, South Africa".





Tokpa Darwolo Jamah, Jr comes from Liberia. He is a graduate of AIMS-Cameroon where he obtained a Master's Degree in Mathematical Sciences. He also holds a BSc Degree in Mathematics from the University of Liberia. He is currently registered for an MSc in Mathematical Sciences, working with Prof John Hargrove on Modelling Trypanosomiasis Control in a Multi-host Population.

Fanuel Otieno is an MSc student who will be working with Dr Wim Delva on age mixing and sexual transmission of HIV. Fanuel is a graduate of AIMS-South Africa where he obtained a Master's Degree in Mathematical Sciences.



Khaphetsi Joseph Mahasa comes from the Mountain Kingdom of Lesotho. He is a PhD student in Mathematical Sciences, working with Dr Rachid Ouifki on the mathematical modelling of tumour-immune interactions and cancer therapy.

Sandile Ginindza recently joined SACEMA on a part-time basis as a PhD fellow concentrating in Epidemiology where he is investigating "The interaction between Drug-Resistant TB case finding and Drug Resistant TB Prevalence in Swaziland". He is an evaluation expert and a public health professional from Swaziland. He graduated in 2014 with a Master of Public Health degree from the University of Kentucky, USA concentrating in Population Health Management & Policy. He also holds a Bachelor of Arts degree in Social Science (BASS) from the University of Swaziland (UNISWA) in 2008 majoring in Demography and Sociology.



Cari van Schalkwyk is currently on maternity leave. SACEMA congratulates her on the birth of her daughter, Nina.

Visiting Researchers



SACEMA hosted Neema Masha from 2-16 March, on an HIV Research Trust Scholarship. She is a biostatistician at Kilimanjaro Christian Medical University College in Tanzania, in the final stages of an MPH in Biostatistics and Epidemiology. Neema writes: "My visit was very, very productive -- the training sessions, the presentations attended, the private talks and the research days were fabulous. Pass my regards to all there."

Yusuke Asai came to SACEMA as an intern from 18 March - 15 April. Following his Masters in Mathematics at Tokyo, and some time as a researcher in Poland, he is working at Institut für Biostatistik und mathematische Modellierung, Universität Klinikum Frankfurt, Goethe Universität, in Germany.



Stefano Ongarello visited SACEMA to work with Alex Welte on the CEPHIA project, from 11-16 May. He lives in Geneva and works as a Senior Biostatistician at the Foundation for Innovative New Diagnostics (FIND).

Simon Daniel is spending a few months at SACEMA working with Alex Welte and Cari van Schalkwyk on updating the Assay-Based Incidence Estimation (ABIE) spreadsheet tools available on the Incidence Estimation website (<http://www.incidence-estimation.com/>) run by SACEMA. Simon is from Melbourne, Australia where he studied Maths and Physics at the University of Melbourne. Prior to visiting SACEMA, he spent 8 years in Mexico pursuing various interests such as dancing, teaching English and studying Economics.



INTERNATIONAL MEETINGS:

Dr Rachid Ouifki participated in the Workshop on Tumor-Immune Dynamics Held at the American Institute of Mathematics in San Jose, California, USA, from 5th to 9th January 2015. The workshop dealt with the mathematical and computational modelling of tumor-immune dynamics with a focus on the immunotherapy as a means of control for tumour growth.



Participants of the Workshop on Tumor-Immune Dynamics, January 2015.

INTERNATIONAL EXCHANGE PROGRAMMES:

International Clinic on Disease Dynamics, and Data (ICI3D) Research Scholars Exchange Program

This program provides former MMED and DAIDD participants the opportunity to do a 6-week research exchange abroad. Last year we welcomed Sarah Ackley from UCSF, who visited John Hargrove to work on estimating tsetse fly mortality from ovarian age distribution data. A paper was recently published arising from this work, which is the first of what we hope will be a long line of ICI3D scholar exchange publications.

This year Roger Ying, of the University of Washington, spent 3 weeks at SACEMA from 12 January, on the first leg of his I3D Scholar Exchange visit to work with Brian Williams. He then moved to Johannesburg to continue working with Brian until mid-April. Roger gave a Skype presentation on the work recently and they have made excellent progress on developing a mathematical model for use in sub-Saharan African HIV monitoring. The model will be useful for estimating HIV incidence and mortality, and making projections --calculating outcomes such as infections averted, lives saved, cost-effectiveness. There are a number of other models developed for HIV monitoring, but the unusual features of this model are that it is exceptionally user-friendly, requiring minimal support and training, and that it can run on any computer.

Pittsburgh exchange student programme

Faikah Bruce has been selected for the Pittsburgh International Student Fellowship Program, and will spend 2 months July -- August at the University of Pittsburgh Graduate School of Public Health, working on HIV modelling with Prof Mark Roberts.

Her counterpart, Yuruo Li, will be visiting SACEMA 29 May - 10 August. She is an MPH student majoring in Epidemiology, and has an anthropology and mathematics background. She hopes her anthropology will help her to better understand the local culture and behaviour patterns which could contribute to the spread of infectious diseases in South Africa.

EVENTS:

SACEMA Research Days 2015

About forty people took part in SACEMA's annual 'Research Days' meeting in Stellenbosch, over two full days, 24-25 March, kicking off with refreshments at SACEMA on Monday evening 23rd March. Twenty-one SACEMA funded students gave talks on their work-in-progress and engaged in discussions with a friendly though critical audience, including SACEMA researchers and supervisors from other universities, five of whom accepted the invitation to participate. Fifteen were PhD students, and six were Masters; a number of new Masters students have only just arrived and were not required to give talks. Senior speakers were SACEMA's Wim Delva (Connecting the dots: sexual network data and models in HIV epidemiology), and two excellent key-note speakers -- Leigh Johnson on the first day (Drivers of HIV incidence in South Africa) and Wilfred Ndifon on the second day (Organising principles of T-cell diversity). As usual, high priority was given to informal interaction as well as the formal question-time after each talk. Participants enjoyed a spit-braai on the Tuesday evening, and a majority were able to attend the conference dinner on Wednesday evening at Decameron Restaurant. The event was a great opportunity for SACEMA staff to meet the students and for students old and new to meet each other, present their work and receive incisive, constructive criticism. The topics presented covered a very wide range, all fitting into the bigger picture of SACEMA's 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. Her report has been received and is being circulated, studied and discussed.



Staff, students and supervisors at SACEMA Annual Research Days Meeting, March 2015

SACEMA Seminars

The following seminars were held between January and May:

- 11th February: Roger Ying, Researcher, University of Washington International Clinical Research Center: “Developing a user-friendly HIV simulation model”.
- 11th February: Rachid Ouifki, Senior Researcher, SACEMA: “Modelling the control of Trypanosoma brucei rhodesiense through mass chemoprophylaxis and insecticide-treated cattle”.
- 6th March: Wilfred Ndifon, Researcher, African Institute for Mathematical Sciences (AIMS): “Improving influenza vaccine effectiveness”.
- 12th March: Margaret Brandeau, Coleman F. Fung Professor of Engineering and Professor of Medicine (by Courtesy, Stanford University: “Network Modeling of HIV: Theory and Applications”.
- 13th March: Neema Mosha, researcher and bio-statistician, Kilimanjaro Christian Medical University College: “Hypertension prevalence, awareness and contributing factors in a Population based study”.
- 20th March: Alana de la Harpe, MSc Student, Stellenbosch University: “A Comparative analysis of mathematical models for HIV epidemiology”.
- 24th March: Bob Snow, Professor of Tropical Public Health, Centre for Tropical Medicine, Nuffield Department of Medicine, University of Oxford: “An overview of malaria in Africa”.
- 14th April: Yusuke Asai, Phd Student, Frankfurt University, Germany: “Hepatitis C virus dynamics and mathematical modeling by stochastic and random ordinary differential equations”.
- 30th April: Tendai Mugwagwa, Visiting Research Fellow, Imperial College, London and Mathematical Modeller, Public Health England: “Tailoring tuberculosis interventions in different hard to reach population settings to ensure valuable resources are used cost-effectively”.
- 7th May: Anna Grimsrud, PhD Student and Researcher, University of Cape Town: “Community-based Adherence Clubs – insights from the implementation experience at the Gugulethu Community Health Centre”.

Courses

Jo Barnes’ **Introduction to Epidemiology and Research Methodology**, has been running at SACEMA with weekly sessions from February to May, drawing a number of external participants as well as the five SACEMA students.

Matt Fox gave a fifth iteration at SACEMA of his **Advanced Epidemiological Methods course**, 18-21 May, with 35 participants, 6 of whom were from SACEMA. This course was last offered in 2013. In 2014 Matt presented a course on Quantitative Bias Analysis of Epidemiologic Data.



Matt Fox and participants of the Advanced Epidemiological Methods Seminar, May 2015

Special Events

Faikah Bruce was invited to attend the Opening of Parliament on 12 February. As part of the celebrations of 20 years of democracy, nominations were commissioned of promising PhD candidates to attend the event. Faikah affirms that it was great fun, instructive, and entertaining. While there was some much publicised violence associated with the event, Faikah enjoyed the experience, and met some interesting peers.



Faikah Bruce at SONA 2015

Eva Ujeneza, a PhD student at SACEMA working with Martin Nieuwoudt on mathematical models for immune reconstitution of HIV positive patients on HAART, was invited to attend the fifth **Gender Summit 5 (Africa)** at the Cape Town International Conference Centre between 28-30 April 2015 upon invitation by the Next Einstein Initiative (NEI).

In her own words: "Attending the conference was an enriching experience. Several speakers pointed out gender biases that are deeply entrenched in the field of science and technology research. For example, most drugs are primarily developed for men (using male-animal models) and then get adapted to women. However, suggestions were put forward to curl out this bias in research, which included: increase gender analysis in research in order to incorporate women preference in technology development, allowing for the development of drugs adapted to women; train board members and recruitment panels to avoid the unconscious bias of expecting higher standards from women candidates than from men; and to 'genderize' policies so that they can be more adequate to women, just to cite a few."



Eva Ujeneza at the Gender Summit, April 2015

UPCOMING EVENTS:

Clinic on the Meaningful Modelling of Epidemiological Data (MMED), 1-12 June 2015

The Clinic on Meaningful Modelling of Epidemiological Data will take place 1-12 June, at AIMS in Muizenberg. This will be the 7th edition of the Clinic, an annual two week training event that brings together African and American student participants and is organized jointly by a consortium of North American faculty and SACEMA faculty. This year six SACEMA students will be participants, three SACEMA students (Eva Ujeneza, Joseph Sempa and Roxy Beauclair) will be among the four mentors, and one (Faikah Bruce) has joined the DAIDD Faculty.

Course on Missing Data, 16-18 September 2015

Dr Jonathan Bartlett (Department of Medical Statistics, London School of Hygiene & Tropical Medicine, UK) will present this three day course at Stellenbosch under the auspices of the South African DST/NRF Centre for Epidemiological Modelling and Analysis (SACEMA). Registration should be done online at www.sacema.org. The closing date for early bird registration is 30 June 2015.

Joint Modelling of Longitudinal and Survival Data, with Applications in R: 19-21 October 2015

Dr Dimitris Rizopoulos (Department of Biostatistics, Erasmus University Medical Center, the Netherlands) will present this intensive three-day course at Stellenbosch in October. Registration should be done online at www.sacema.org. The closing date for early bird registration is 31 July 2015. Enquiries may be directed to Lynnemore Scheepers (scheepersl@sun.ac.za).