DST/NRF Centre of Excellence in Epidemiological Modelling and Analysis

SACEMA

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SACEMA Newsletter 3

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1 SACEMA LAUNCH

The official launch of SACEMA was celebrated on 18 May 2006 at StIAS in Stellenbosch, with dignitaries including the Deputy Minister of Science and Technology, Mr Derek Hanekom, the Director General of the Department of Science and Technology, Dr Phil Mjwara, the Rector of Stellenbosch University Prof Chris Brink and senior staff of the National Research Foundation and Stellenbosch University.

Above: attendees at the launch: Ms Anati Canca (DST); Prof Ekkehard Kopp (Chairman, Board of Trustees); Prof Walter Claassen (SUN); Dr Phil Mjwara (DG of Dept of S&T); Mr Derek Hanekom (Deputy Minister of S&T); Prof Chris Brink (SUN) and Dr Brian Williams (WHO).

In welcoming the more than fifty guests Prof Brink drew attention to the historic occasion. SACEMA is the first of the DST/NRF Centres of Excellence to be started from scratch and is housed on the beautiful historic site of Mostertsdrift, the first farm to be granted outside of the city Cape Town by the Governor of the Cape in 1683.

In his speech, Mr Hanekom, Deputy Minister of Science and Technology, acknowledged that the launch of this centre was a seminal event that will contribute to the goal of “improved quality of life for all South Africans, as well as millions of people across the continent”.

On the same day, we were also able to hold the first meeting of the Board of the SACEMA Centre of Excellence, as well as the second meeting of the

Board of the SACEMA Trust. The two Boards have committed to working together in supporting and directing SACEMA towards its goals.

2 NEW APPOINTMENTS AT SACEMA

Since our last newsletter, we are delighted to have made several appointments at SACEMA. Our wine-cellar premises are becoming increasingly office-like with our new staff and the various internal renovations we are making.

For those of you who haven't already met John Hargrove, he was appointed as SACEMA director in early 2006. John has worked for more than 30 years in the field of tsetse fly biology and control, applying mathematical analytical and modelling techniques in the field of physiology, behaviour and population dynamics

Fazia du Plessis is the new face of SACEMA, having joined us in July in an administrative capacity, being seated at reception. She has many years of work experience in administration, most recently for the western Cape Education Department, having worked in several junior and senior schools.

Margaret Ward is the new Research Manager for SACEMA. Margaret has worked at UCT for several years in research management, and has an MBA from the same institution.

Rachid Ouifki has been appointed as a Visiting Research Fellow at SACEMA for 3 years, after completing his postdoc with us. He has a PhD in Applied Mathematics from the University of Cadi Ayyad, Marrakesh and the Institute for Research and Development, Paris.

His field of interest is stability analysis and bifurcation of ordinary and delayed differential equations. He is currently working on mathematical modelling and analysis of HIV/AIDS dynamics and HIV-TB interactions.

Carel Pretorius has an MSc from the University of the Witwatersrand in Applied Mathematics, and will shortly be registering for a PhD, funded through SACEMA.

He is currently working on a WHO-funded project to validate and contextualize a micro-simulation model to the dual-epidemic problem of HIV & TB.

3 CURRENT AND PLANNED ACTIVITIES

(i) DIMACS Workshop, 26-28 September 2006, Wits

The title of this meeting was “Facing the Challenge of Infectious Diseases in Africa: the role of Mathematical Modelling” and was organised jointly by the US-based Center for Discrete Mathematics and Theoretical Computer Science (DIMACS), AIMS, SACEMA and the University of the Witwatersrand. The international organisers include Professors Fred Roberts (Rutgers University, New Jersey, USA) and Abba Gumel (Manitoba), with Dr Alex Welte (CAM, Wits), whose research has received substantial support from SACEMA, as the principal local organiser.

SACEMA pledged R80, 000 for this meeting, which was channelled exclusively towards funding the travel and subsistence expenses for meeting participants from the southern African region. There will be a two-week follow-up training course in mathematical epidemiology to be held at AIMS in June 2007, to be followed by a three-day conference to be held in Stellenbosch. SACEMA has already agreed to provide substantial funding for both events and to take charge of the logistical support and organisation of the events.

The broad themes of the meeting covered the current status of epidemiology and control of infectious diseases in Africa; as well as capacity building and outreach activities fostering greater interaction between African and North American researchers.

Several of the presentations from the conference are posted on the website - for more information, please visit:
http://dimacs.rutgers.edu/Workshops/Diseases/

Above: Delegates attending the DIMACS Workshop, 26-28 September 2006, University of the Witwatersrand, Johannesburg

(ii) TB and HIV Modelling Conference, 6-8 November 2006

SACEMA will be hosting a conference on epidemiological modelling techniques during November at the University of Stellenbosch. Major funding for the conference was sourced from the EU, however, SACEMA has committed some support including the venue (the Neelsie at Stellenbosch University) and logistical assistance.

The first day of the conference will be a training day, providing a brief introduction to different types of modelling. The three areas to be covered include population-based modelling, micro-simulation and remote sensing. The following two days will provide a combination of keynote lectures in pivotal areas of disease modelling, including shorter oral presentations covering various relevant issues. Keynotes are being presented by Brian Williams, WHO; Richard White, LSHTM; Lieven Annemans, Univ. Gent; Nesri Padayatchi, UKZN; Francois Venter, Wits; and Carolyn Williamson, UCT.

For more information, please visit: http://www.tbandhivmodelling.org/

(iii) Micro-simulation Workshop, 20-22 November 2006

This workshop will focus on micro-simulation models, and will be hosted by SACEMA to bring together researchers (mainly from southern Africa, as well as international partners) interested in micro-simulation.

The program will include an overview of micro-simulation and important problems for application, a technical review of current and planned micro-simulation models, and discussion of future work, in an interactive and informal atmosphere. As SACEMA has recently started on a WHO-funded micro-simulation project to model HIV-TB co-infection in the Western Cape, these discussions will be conducted with relevance to this project.

Micro-simulation models view a population as a collection of individuals, with their characteristics and inter-personal relationships. This technique allows the modeller to track the individual history of an HIV infection, the transmission of HIV via specific inter-personal sexual relationships, and the impact of AIDS on family relationships. Micro-simulation is stochastic in that events such as HIV infection, birth and death, occur as random processes, although the probabilities that govern the processes are often held constant.

The workshop is deliberately being kept very small with the hope that the invited workers can actually get to grips with real-life computing and data analysis problems and make practical progress with various micro-simulation techniques during the course of the workshop.

For more information, please contact Dr Alan Matthews:
matthewsa@ukzn.ac.za

4 CONFERENCES ATTENDED

2006 AIDS Meeting Toronto

SACEMA funded the attendance at the Toronto meeting of Dr. Jamie Lloyd-Smith who completed his PhD last year at the lab of SACEMA associate Prof. Wayne Getz. Jamie presented a poster at the conference detailing the theoretical work carried out by him and other SACEMA workers and associates (see Publications).

SACEMA Director John Hargrove attended the Toronto meeting making an oral presentation, at a satellite meeting on STARHS methods for incidence estimation on the development of CDC's BED method for the estimation of HIV incidence from cross-sectional surveys. He also presented a poster detailing the work he carried out with workers at ZVITAMBO in Zimbabwe, indicating major declines in HIV prevalence and incidence in Harare, Zimbabwe.

5 ONGOING AND NEW RESEARCH INITIATIVES

5.1. Collaboration with Desmond Tutu HIV Centre.

The Desmond Tutu HIV Centre (DTHC) is involved in providing ART to patients in the public sector, and performing related HIV research. They have various research sites, including Masiphumelele in the western Cape where they are investigating the impact of ART treatment on the community tuberculosis rates and the patterns of TB transmission.

SACEMA has joined with the DTHC to model these patterns of transmission within the Masiphumelele community.

5.2. Collaboration with the Institut de Recherche pour le Développement (IRD)

SACEMA has entered into an arrangement with IRD, particularly their research unit GEODES, regarding collaboration around epidemiological issues. GEODES is sponsoring several of their staff members to work with SACEMA in Stellenbosch for several months to assist on the Masiphumelele project with the Desmond Tutu HIV Centre.

Nicolas Bacaer will be joining SACEMA in November 2006 to analyse the Masiphumelele data from a differential equations perspective. Pierre De Beaudrap, a medical doctor, will be assisting with microsimulation of the data, as well as being involved on the medical side if necessary.

5.3. Alan Matthews and Pasteur Institute

Dr Alan Matthews, based at the University of KwaZulu-Natal is currently involved in developing an HIV-AIDS micro-simulation model in collaboration with the Epidemiology of Emerging Diseases Unit of the Pasteur Institute, Paris. This work is partly funded by SACEMA, the International AIDS Society, and the France-South Africa International Cooperation Programme.

Dr Matthews has been involved with SACEMA since its founding conference in December 2003.

5.4. Bertran Auvert

We reported in our previous newsletter on the Orange Farm trial led by Professor Bertran Auvert, Professor of Epidemiology at the University of Versailles, on male circumcision and its affects on the transmission of HIV. The results of this trial were presented at a SACEMA/UNAIDS meeting in November 2005, and have received wide international attention.

These results have been utilised in two modelling studies supported by SACEMA. The first has been published recently and is an estimation of the potential impact of scaling up male circumcision in Africa on the number of new HIV infections and deaths due to AIDS that could be averted in the next

decades. The second is an ongoing study estimating the cost-effectiveness of an intervention based on male circumcision.

Further SACEMA-funded analyses have also flowed from this study. The first analysis describes the sexual behaviour change associated with male circumcision. Recently circumcised young men could feel protected by male circumcision and could change their sexual behaviour leading to a higher risk of HIV infection. This risk compensation analysis has now been submitted for publication. The second analysis aims to use the data set of the Orange Farm trial to assess the impact of male circumcision on the condom use, and is ongoing.

5.5 Joris Borgdorff

Joris Borgdorff is a Dutch computer science and math graduate who will be joining SACEMA for 6 months starting in September 2006. He will be focusing on the development of micro-simulation models relating to the Masiphumelele data.

5 PUBLICATIONS

Cowan F.M., Pascoe S.J.S., Barlow, K.L., Langhaug, L.F., Jaffar, S., Hargrove, J.W., Robinson, N.J., Latif, A.S., Bassett, M.T., Wilson, D., Brown, D.W.G., & Hayes, R.J. **Association of genital shedding of herpes simplex virus type 2 and HIV-1 among sex workers in rural Zimbabwe.** *AIDS* 2006 **20**, 261-268.

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Humphrey, J.H., Hargrove, J.W., Malaba, L.C., Iliff, P.J., Moulton, L.H., Mutasa, K., Zvandasara, P., Nathoo, K.J., Mzengeza, F., Chidawanyika, H., Zijenah, L.S., Zunguza, C.D., Ward, B.J. and the ZVITAMBO Study Group. **HIV incidence among post-partum women in Zimbabwe: risk factors and the effect of vitamin A supplementation.** *AIDS* 2006 **20**: 1437-1446.

Mahomva, A., Greby, S., Dube, S., Mugurungi, O., Hargrove, J., Rosen, D., Dehne, K-L., Gregson, S., StLouis, M., Hader, S., **HIV prevalence and trends from data in Zimbabwe, 1997-2004.** *Sexually Transmitted Infections* 2006 **82**, (Supplement STI): i42-i47.

Ouifki R. & Witten G.W. **A model of HIV-1 infection with HAART therapy and intracellular delays.** Journal of Discrete and Continuous Dynamical Systems B 2006 (*in press*).

Ouifki R. & Witten G.W. **Model of intracellular delays of HIV-1 lifecycle on RTI therapy.** Journal of Mathematical Biology 2006 (*accepted under reservations*).

Ouifki R. & Witten G.W. **Stability analysis of within cell positive strand viral dynamics.** Theoretical Population Biology (*submitted*).

Ouifki R. & Witten G.W. **Modelling Haart Treatment of HIV using a 3 delays model Presented at the Mathematical Biology and BioComplexity in Africa**, 31 January – 02 February 2006. University of Cape Town, South Africa. http://www.mth.uct.ac.za/Biomaths/Complexity/

Ouifki R. **Model of HIV-1 Life-Cycle with Periodic Drug Efficacy and Three Intra-Cellular Delays** *Poster presentation at DIMACS Workshop on Facing the Challenge of Infectious Diseases in Africa: The Role of Mathematical Modeling*. September 25 - 27, 2006. University of the Witwatersrand, Johannesburg, South Africa.

Pretorius C. & Welte A. **Investigating viral parameter dependence on cell and viral life cycle assumptions.** [Poster presented at the DIMACS Workshop, Wits, Johannesburg 20-22 September 2006].

Williams B.G., Lloyd-Smith J,O., Gouws E., Hankins C., Getz W.M., Hargrove J., Dye C. & Auvert B. **The potential impact of male circumcision on HIV in sub-Saharan Africa.** 2006 PLoS Medicine **3**: e262.