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Social Highlights

DIMACS Workshop on Facing the Challenges of Infectious Diseases in Africa: The Role of Mathematical Modelling

University of the Witwaterstrand, Johannesburg,
South Africa; Sept. 25-27, 2006

Aims and Objectives

- To bring together scientists from the US and various African countries, as well as junior researchers and students from the US and Africa, to share ideas on effective ways to combat the spread of emerging and re-emerging diseases that inflict severe public health and socio-economic burden in Africa:
 - ▶ HIV, TB, malaria, HIV co-infection, animal diseases
- To discuss recent progress and challenges associated with disease transmission (and burden) in Africa: public health policies; data issues (collection and sharing);
- To foster partnerships, collaborations and capacity building;
 - ▶ collaborations between researchers
 - ▶ training of students and junior scientists (and networking/collaborations);
 - ▶ encourage greater participation of Africa-based public health officials and clinicians in mathematical epidemiology

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- ◇ Current state of infectious diseases in Africa and special challenges for mathematical modelling
- ◇ Mathematical modelling of diseases that inflict a significant burden on Africa
- ◇ Modelling issues arising from the threat of emerging diseases in resource-poor countries
- ◇ Optimization of scarce public health resources
- ◇ Vaccination strategies

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60 participants from Africa, US **AND** Canada

(i) Mathematical Biologists:

- ▶ Leading experts;
- ▶ Graduate students and postdoctoral fellows (from Africa and the US; AIMS, HBCUs);
- ▶ “New-comers” to the field;

(ii) Medical/Clinical Scientists:

- ▶ Public health officials;
- ▶ Vaccine manufacturers;
- ▶ MDs

(iii) Other Mathematical Scientists

- ◇ Diversity and geographic spread of participants and research topics covered.

Organizing Committee

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Dominic Clemence (NC A&T State University)

Wayne Getz (UC Berkeley)

Abba Gumel (Manitoba)

John Hargrove (SACEMA)

Ewdard Lungu (Botswana)

Fred Roberts (DIMACS; Chair)

Program Committee

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Wayne Getz (UC Berkeley)

Abba Gumel (Manitoba; Chair)

John Hargrove (SACEMA)

Brenda Latka (DIMACS)

Fred Roberts (DIMACS)

Brian Williams (WHO)

Advisory Committee

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Ronald Brookmeyer (John Hopkins University)

Donald Burke (Johns Hopkins University)

Carlos Castillo-Chavez (Arizona State University)

Peter Ekkehard Kopp (University of Hull)

John Glasser (CDC Atlanta)

Fritz Hahne (AIMS)

Simon Levin (Princeton University)

Ramanan Laxminarayan (Resources for the Future)

Martin Meltzer (CDC Atlanta)

Wandera Ogana (University of Nairobi)

Local Organizing Committee

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Edward Lungu (University of Botswana)

David Sherwell (University of the Witwatersrand)

Alex Welte (University of the Witwatersrand; Chair)

- Special thanks to Brenda Lacey-Smith (WITS); Christine Spassione (DIMACS) and many others at WITS and DIMACS

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Dominic Clemence (NC A& T State University)

Ronald Mickens (Clark Atlanta University)

Asamoah Nkwanta (Morgan State University)

Abdul-Aziz Yakubu (Howard University)

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- (i) African Institute for Mathematical Sciences (AIMS)
- (ii) Burroughs Wellcome Fund
- (iii) DIMACS
- (iv) US National Science Foundation
- (v) South African Centre for Epidemiological Modelling and Analysis (SACEMA)
- (vi) School of Computational and Applied Mathematics, WITS University
- (vii) WITS AIDS Research Initiative

Summary of Workshop

- 24 research talks; focus on a number of issues including
 - ▶ overview of current state of disease dynamics in Africa
 - ▶ modeling: analysis, data acquisition and challenges
 - ▶ model types: deterministic; discrete; stochastic; simulations; random walk; (in-host, population-level)
 - ▶ evaluation of control strategies: ARVs, vaccines, quarantine, isolation
 - ▶ modeling animal diseases: Bovine TB; zoonotic mycobacteria
 - ▶ modeling in fluctuating populations
 - ▶ predictive power of (in wildlife populations)
 - ▶ economic epidemiology
 - ▶ strategies for combatting new emerging diseases (e.g., pandemic flu)
 - ▶ optimization of public health resources
 - ▶ social infrastructure against disease-related workforce depletion
 - ▶ role(s) of discrete mathematics in epidemiology

Summary Ctd.

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Disease modeling:

Biological issues
Public health

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- numerous diseases addressed including:
 - ▶ Bovine TB; cervical cancer; Dengue hemorrhagic fever; HIV/AIDS and co-infection; HPV; HSV2; Lyme disease; Malaria; Pandemic influenza; Pertussis; Rotavirus; SARS; TB; Zoonotic mycobacteria

- discussion groups (and presentation)

- 26 posters!

New trends in disease modeling:

- ▶ increasing diversity of modeling techniques:
 - ▶ network models (scale free, small world)
 - ▶ meta population
 - ▶ agent based model (individual modeling)
 - ▶ branching processes
 - ▶ random walks
- ▶ data related issues:
 - ▶ acquisition of quality data
 - ▶ parameter estimation
 - ▶ sensitivity and uncertainty analysis
- ▶ modeling emerging, endemic and re-emerging diseases
- ▶ increasing number of new intervention strategies:
- ▶ expansion of the concept of R_0 to incorporate heterogeneity

New trends in biological issues:

- ▶ evolutionary dimension (selection for mutations that confer resistance to infection)
- ▶ use of ARVs and vaccines: targeted allocation; vaccine properties (therapeutic benefits)
 - ▶ emergence and evolution (plus consequence) of ARV-resistant strains
 - ▶ challenges for designing effective HIV vaccine (for multiple clades)

Public health issues

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- ▶ local vs. global actions (polio eradication example)
- ▶ design of models that address actual public health questions
- ▶ lack of compliance to treatment and vaccination (fear of side-effects): impact on effective disease control
- ▶ foster greater (effective) 2-way interactions between modellers and public health professionals
- ▶ effective communication of modelling ideas and results to the general public

Future Plans

- Student shortcourse+Conference: AIMS, 2007
- Meetings in other African countries
- Workshop proceedings? Edited volume?
- Conduct shortcourses for public health practitioners (and “traditional healers”?) (Imperial College & Canadian models?)
- Research training for undergraduates (Summer Schools)
- Foster greater partnerships and collaborations (Africa vs. North America)
- External supervision of graduate students?
- Funds, funds and more funds. Is there a Bill Gates in the house-:))))???

Quotes of the Workshop

- (i) “I take only the credits; all blames must be directed to Brenda Latka” (Fred Roberts);
- (ii) “If the HIV/AIDS pandemic is not effectively addressed, the Botswana parliament would be filled by young boys and expatriates in the near future” (Diana Dickinson);
- (iii) “American dads don’t play with their kids” (Diana Dickinson);
- (iv) “I got your money right here”. John Hargrove waving a large envelope containing thousands of rands for reimbursement of SACEMA-sponsored students;
- (v) “In African context, high body mass implies healthy living” (Edward Lungu);
- (vi) “I happen to be a big fan of models and simulations” (Fred Roberts);
- (via) “Africa is not a country” (Discussion Group 2).

Quotes of the Workshop ctd.

- (vii) “Engineers tend to think that a half-full or half-empty glass is TWICE full” (Michael Washington);
- (ix) “That’s all I know”...Asamoah Nkwanta responding to a question on why he uses random walks;
- (x) “I speak very quickly; am I speaking quickly”? (Nina Fefferman);
- (xi) “These simulations suggest that elimination of all men is the most effective strategy for combatting HPV” (Elamin Elbasha);
- (xii) “If you do not take up the entire foreskin, male circumcision would be no good” (Tony Davies);
- (xiii) “Brain drain is our main problem. You are a classic example” (Fritz Hahne responding to Abba’s suggestion that SACEMA sends students to US and Canada for further training);
- (xiv) “I suck in all things related to data visualization” (Nina Fefferman).

Major Social Highlights

- (i) Nina Fefferman is the best dancer ever...she brilliantly exposed Elamin's monumental lack of prowess in that department;
- (ii) The Fred isn't too bad either. So also are Alex, Brenda and Asamoah. They probably should form a band;
- (iii) Alex looks real cool in his Togolese traditional attire!
- (iv) George Clooney (aka Abba Gumel) was sang a special song by a renowned Zimbabwean duo;
- (v) Nicole should enrol in Nina's Dance 101 class...without further delay;
- (vi) Miriam is as good a dancer as Elaine (of Seinfeld) was;
- (vii) Rumor has it that Gerardo has "found" a spouse in South Africa...she is one of the 5 female dancers at the Moyo Restaurant. Congrats, Gerardo! How about honeymoon at the Kruger National Park?