



*The University of Western Ontario*

Faculty of Science

Department of Applied Mathematics

## APPLIED MATHEMATICS COLLOQUIUM

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Date: Tuesday, March 25, 2008

Time: 3:30 pm

Location: Middlesex College Room 204

### **Using Modeling to Evaluate the Ethics of Allocating Antiretrovirals in Africa**

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#### **Abstract:**

Antiretroviral therapy (ARV) is becoming available in South Africa. Demand will exceed supply; thus, difficult decisions will have to be made in allocating ARV. The majority of those treated for HIV are likely to be in cities, because health infrastructure and personnel are concentrated in urban centers. We predict the epidemiological impact of drug allocation strategies (DAS) by using a spatially explicit model that links urban and rural epidemics. We parameterize our model by using data from the KwaZulu-Natal province in South Africa. We model the South African government's treatment plan from 2004 –2008, and we predict the consequences of one DAS that allocates drugs only to Durban and of two DAS that allocate drugs to both urban and rural areas. All three strategies would treat 500,000 people by 2008. Not surprisingly, the Durban-only DAS would prevent the greatest number of infections (an additional 15,000 infections by 2008). However, it may have been expected that this DAS would generate the highest levels of transmitted resistance, because it concentrates ARV in one location. Paradoxically, we found that this DAS would generate the lowest levels of transmitted resistance. Concentrating treatment in Durban would also avert the greatest number of AIDS-related deaths. This DAS would satisfy the ethical principle of utilitarianism, but would not satisfy the ethical principle of treatment equity. We then present a study where we develop an ethical DAS (based upon treatment equity) for ZwaZulu-Natal Province. Finally we discuss the difference in DAS that would occur if the principle of treatment equity was used versus using the principle of utilitarianism.