

Network Model of HIV Epidemic in Downtown Eastside of Vancouver

Lukas Ahrenberg¹, Sarah Kok¹, Bojan Ramadanovic^{1,2}, Sandy Rutherford^{1,2}, Krisztina Vasarhelyi^{1,3}

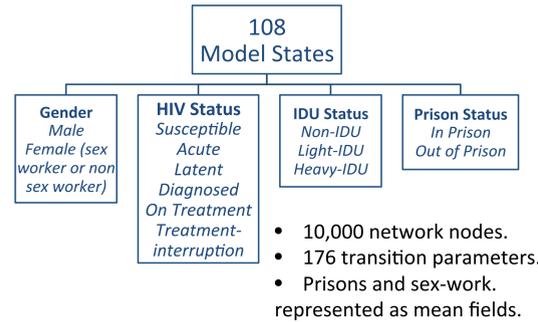
1: IMPACT-HIV 2: Complex Systems Modelling Group, IRMACS SFU, 3: BC Centre for Excellence in HIV-AIDS

DTES:

- Vancouver's Downtown Eastside (DTES) is a marginalised community of 16,000 with high risk of HIV infection.
- DTES is one of the most significant epicenters of the HIV epidemic in Canada. HIV prevalence is close to 25%.
- Intensive harm reduction efforts helped reduce infection rates which peaked in 1996.
- DTES is one of two sites of the STOP HIV/AIDS pilot project, supported by the BC government, which seeks to improve delivery of Highly Active Antiretroviral Therapy (HAART) as a part of Treatment as Prevention program.

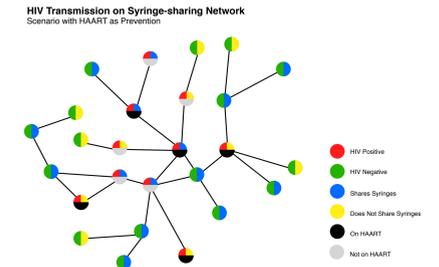


Our Model:



Network Models:

- Individual agents with multiple properties (i.e. gender, IDU status, sex-work status, incarceration status, sero-status etc..)
- Links between individuals representing social and/or sexual relationships.
- Shape of the network reflective of what is known about real social and sexual networks ("small world", community formation, associativity, clustering etc..).
- Links can transmit both the infection itself and various social behaviors.
- In general, there is large number of properties and transition parameters so the model can be hard to build and validate.



Seek, Test, Treat and Retain program:

- International paradigm for fighting HIV, endorsed by BC government and championed. envisioned and administered in BC by the BCCfE.
- Relies on idea of treatment as prevention, whereby viral suppression due to Highly Active Anti-Retroviral Treatment (HAART) not only improves individual health outcomes but also dramatically reduces the infectivity of the treated individual.
- By identifying the infected individuals early, particularly among the marginalized and hard to reach populations STTR program gives them opportunity of earlier treatment with both individual and public health benefits.
- STTR is a multi-pronged program aiming at faster diagnosis of HIV as well as faster treatment initiation as well as treatment program retention.
- Our scenarios tests the individual impacts of all three aspects of STTR program as well as that of a hypothetical harm reduction program leading to lower uptake of the drug-injecting behavior in DTES.

Validation:

Comparing model results with 3 BCCfE cohort studies. We are fitting only 2 parameters out of 176. Can we recreate realistic epidemic in the model?

	IDU HIV prevalence	Sex worker HIV prevalence	Non sex-worker HIV prevalence	Frequency of IDU in the community	Annualized HIV incidence among IDUs
Cohort studies	27%	32%	21%	30%	2-3%
Model	24%	33%	23%	34%	2.2%

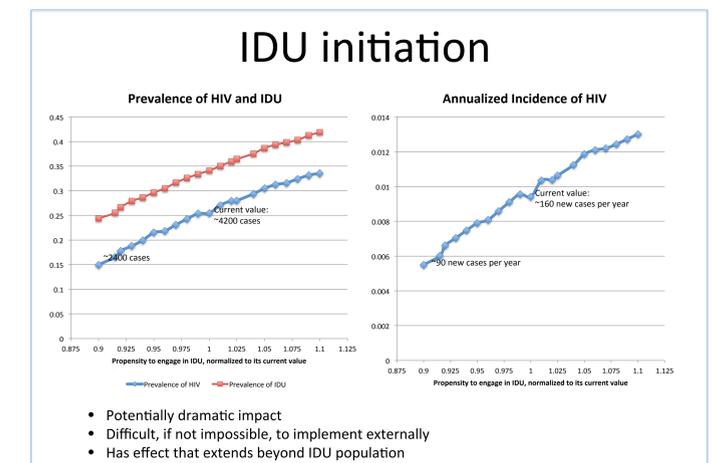
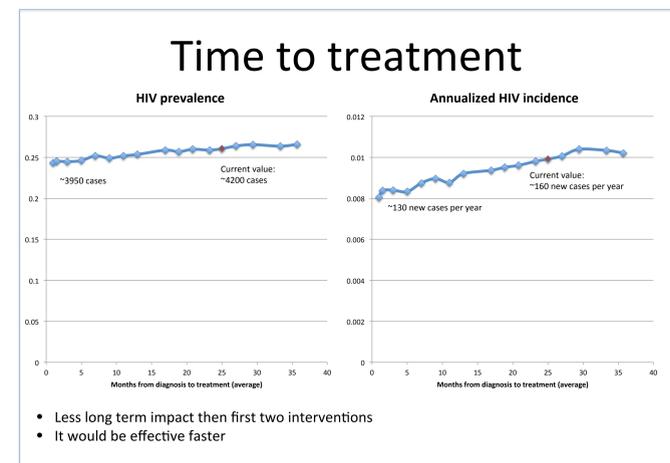
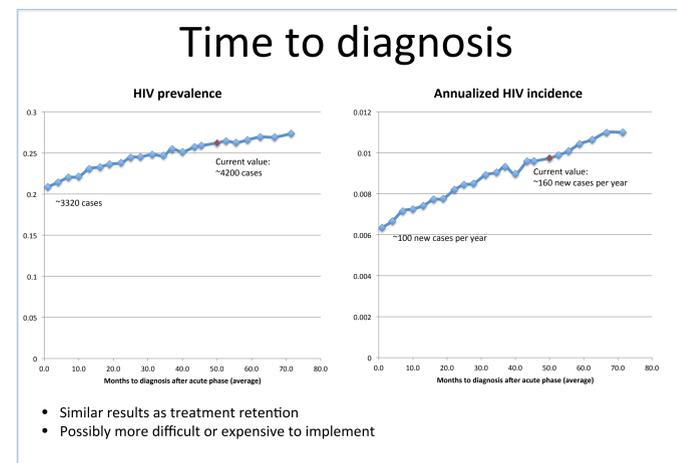
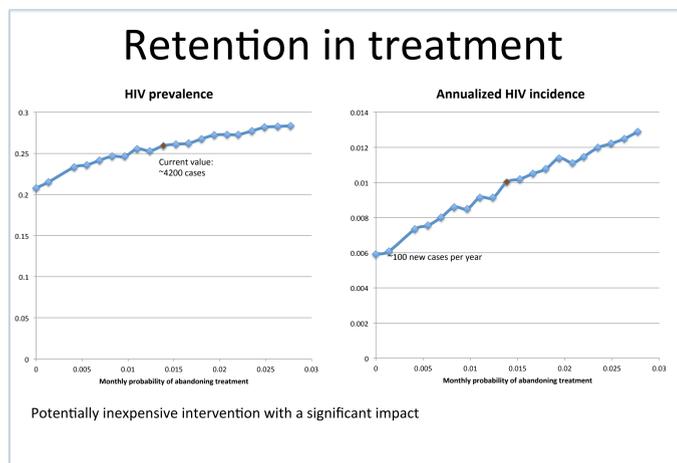
Model validates within accuracy of the cohort studies

NepidemiX:

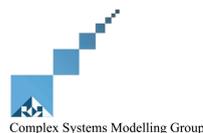
Initially developed for use in this project, NepidemiX is an extremely versatile tool for constructing network models. Helps us overcome some of the typical problems in the construction of network models. Translates descriptions of agent states, their relationships, and the rules governing state changes into a program. Has wide variety of uses. Is integrated with Python NetworkX. <http://nepidemiX.irmacs.sfu.ca>



Scenarios:



Scenario parameters vary across population – i.e. female IDUs have different retention rates than male non IDUs etc... for ease of visualization only one sub-population value is represented on x axis of the plots. In the scenarios as run, all the sub-population values vary proportionately to the one represented.



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