HIV intervention models for criminal justice involved substance-using Black MSM

Title: HIV intervention models for criminal justice involved substance-using Black MSM

Lead Investigator(s): Nina Harawa, Ph.D.
Institution: Geffen School of Medicine at University of California Los Angeles
Address: 911 Broxton Avenue, 1st Floor Los Angeles, CA 90024
Telephone Number: (310) 794-8078
Email: nharawa@mednet.ucla.edu

Summary
Criminal justice (i.e., jail and community supervision) involved (CJI) BMSM who use substances represent an important target for HIV intervention. Although effective behavioral and structural interventions exist that target CJI populations, their successful implementation for CJI BMSM networks and communities has not been demonstrated. The current project utilizes Agent Based Models (ABMs) to generate a dynamic synthetic population of CJI substance-using Black MSM. The ABM are derived from local data that includes baseline data on people and households by geography, as well as the dynamic features of the target population such as incarceration, health center, and activity data. The model will be scaled to three counties, which have among the largest jails in the United States, with high numbers of BMSM: Harris TX, Los Angeles CA, and Cook IL. We will parameterize the ABM with multiple data sources each county’s demographics, MSM populations’ sexual and health care behaviors, and jail populations. Social networks will play a dual role in our model. On the one hand, they will be used to determine the set of persons to whom an individual is likely to be exposed (sexual and drug-injecting networks). On the other hand, they will also help determine an individual's behavior regarding the disease, such as his or her access to information, adherence to prevention/treatment, and influence on others. In this respect, our model represents a significant advance over existing models. We will first build models of the HIV epidemic in young (<30 year old) Black MSM in each county to allow countywide projections and then expand them with data on transition periods into, during, and from jails back into community in order to address specific questions related to incarceration.

We are specifically interested in the social/sexual network data in HPTN and the data from the following sections:
Part 1 - HIV testing history and linkage/treatment adherence (all)
Part 2 - Sex with most recently and last male partner, etc. (all)
Part 3 - Other male partners in past 6 months, (all)
Part 4 - Where you met male partners, History of Drug use, Jail/Incarceration history (all)

Specific Aims and Hypotheses
We will adapt a previously developed core open access ABM platform (using the Repast agent-based modeling toolkit) that includes baseline data on people and households by geography, as well as the dynamic features of the target population such as incarceration, health center, and activity (time-use) data. We will scale the ABM to three counties: Harris TX, Los Angeles CA, and Cook IL. Each county includes diverse National AIDS Strategy cities (Houston, LA and Chicago) with high rates of HIV among BMSM; the counties include three of the four largest jails in the United States, and where our team has worked with CJI BMSM previously. Our primary sources of data to analyze the social relationships of CJI substance-using Black MSM will include specialized network modules from the Social and Risk Network (SRN) survey (YBMSM in Chicago), Sexual Acquisition and Transmission of HIV Cooperative Agreement Program (SATHCAP) (BMSM substance-using populations in Chicago and LA), the Young Men's Affiliation Project (YMAP) (YMSM in Houston and Chicago), UConnect (YBMSM in Chicago), HPTN 061 (for BMSM in LA), and MStudy (BMSM in LA). In addition, SRN, YMAP, SATHCAP, UConnect, HPTN 061, and MStudy all include information on important attributes (e.g., gender, race, age, risk behavior) of respondents’ discussion partners, close friends and sexual partners to estimate the average size of people’s acquaintanceship networks, both overall and for specific subpopulations. Our approach will assess the interplay between social and behavioral variables and viral and host factors in a manner that will be adaptive to temporal, network and setting-specific changes. We aim to:
1. Build upon our flexible ABM by incorporating HIV transmission and suppression probabilities at the individual level, including biologic/behavioral data from HIV prevention intervention studies. To calibrate HIV transmission, we will: 1) Incorporate recent biologic data available including published and unpublished HIV prevention findings; 2) Include known biologic co-factors such as sexually transmitted infections and HIV disease stage; 3) Specify decision rules of an agent’s preventive behavior based upon existing data to simulate his adherence to ARVs and effects of this adherence on future behavior; and 4) Validate the model by evaluating its ability to predict HIV incidence over previous time periods.

2. Parameterize this ABM with multiple network data sources available to investigators on specific transition periods of BMSM from the community, to jail, and back to the community/supervision; such “shocks” lead to social/sexual network formation and disruption.

3. Simulate HIV prevention and substance-abuse interventions within criminal justice contexts using the model parameterized in Aim 2. We will: 1) Determine several intervention effects, including HIV incidence, linkage to services and cost, across a range of realistic rates of HIV and substance-abuse service engagement within each context; and 2) Explore how these effects can be modified by specific policy interventions such as changes to marijuana criminalization or Affordable Care Act implementation.

Relevance to HPTN 061 and/or BMSM HIV prevention research or community engagement
Criminal justice settings remain important venues for secondary and primary HIV treatment because people living with and at-risk for HIV are overrepresented among CJI populations. The over criminalization of Black people, particularly Black men, makes this setting – and the periods leading up to and following incarceration – of critical importance for understanding and addressing HIV risk. With the use of high quality data parameters from sources like HPTN, our agent-based model will allow robust comparison of potential intervention approaches, as well as opportunities to model the impacts of policy changes and criminal justice reform on HIV in Black MSM.

Study Design and Analysis (include data analysis plan and/or table shells as appropriate)
To simulate HIV transmission among Black and “other” MSM (defined as all race/ethnicities except Black) in each county, we are creating a dynamic, stochastic agent-based model (ABM). This model is being parameterized using data on several features: demography, biology, behavior, sexual networks, HIV treatment and preexposure prophylaxis (PrEP), and testing and diagnosis. It will later be expanded with data specific to incarceration for CJI BMSM. The model utilizes the exponential-family random graph modeling (ERGM) framework to generate sexual network structure. It is implemented by directly integrating the R-based statnet suite of packages¹ into a Repast for High Performance Computing (RepastHPC) ABM.²