**Transmission modeling of syphilis in the United States**

**Project Overview**

Elevated rates of syphilis have been observed across the country since the late 1990s/early 2000s and show no sign of decline. Current public health efforts are not having the desired effect on syphilis control. Mathematical models provide a tool that can help us understand epidemiologic trends. Models can also provide insights into the potential impact of different inventions. For example, mathematical models have suggested that frequent screening of at-risk individuals may be an effective and cost-effective approach for syphilis control among high incidence populations (1-3). We have constructed a risk-structured transmission model of syphilis that allows us to explicitly consider different affected population groups, including men who have sex with men (MSM) and heterosexual populations of different racial/ethnic groups. Although the model does not currently include congenital syphilis, modeling females of reproductive age allows for the possibility of a future model extension that includes this outcome.

Given the importance that core group composition and geography will have on epidemic characteristics, and the resultant implications for sustaining syphilis control in these different contexts, we plan to fit this model to outbreaks in different geographical regions. We have identified Massachusetts and Louisiana as two states with unique epidemiology, in terms of the relative burden of infection in MSM. Using data from these two states, we plan to address the following questions:

* What impact have current screening practices had on the observed syphilis epidemic?
  + How does this compare with what might have unfolded with no screening?
* In the face of limited resources, what approaches to screening would be most effective at reducing syphilis burden in the population?
* What is the estimated impact of more frequent screening versus expanded screening coverage in different contexts (endemic transmission vs. epidemic)
  + - i.e., are different screening approaches expected to be more effective in different affected population groups?

**Data Needs**

To help with fitting our model, we require state-level data on syphilis case notifications. The age categories we are including are: 15-44y and 45-64y. We are interested in case numbers and rates by infection stage (primary and secondary, and early latent) by sex, and also further stratified by race/ethnicity (Hispanic, non-Hispanic black, non-Hispanic non-black). Data on MSM status, and HIV-coinfection status in MSM are also of interest.

**References**

1. Tuite AR, Burchell AN, Fisman DN. Cost-effectiveness of enhanced syphilis screening among HIV-positive men who have sex with men: a microsimulation model. PLoS One. 2014;9(7):e101240.

2. Tuite AR, Fisman DN, Mishra S. Screen more or screen more often? Using mathematical models to inform syphilis control strategies. BMC Public Health. 2013;13:606.

3. Gray RT, Hoare A, Prestage GP, Donovan B, Kaldor JM, Wilson DP. Frequent testing of highly sexually active gay men is required to control syphilis. Sex Transm Dis. 2010;37(5):298-305.