

## The Spread of STIs in Heterogeneous Populations

Matthew Dorey<sup>1</sup>, K. A. Jane White<sup>1</sup> and Dushyant Mital<sup>2</sup>

<sup>1</sup>University of Bath, Department of Mathematical Sciences, Bath BA2 7AY U.K.

<sup>2</sup>Milton Keynes General Hospital, Buckinghamshire MK6 5LD U.K.

### Abstract

In Bristol, UK, there are currently outbreaks of Syphilis and Hepatitis B. The worry is that since HIV is more easily acquired by an individual with an existing sexually transmitted infection (STI), an outbreak of HIV in the city may follow.

Many social groupings make up the sexually active population within the city, each with their own characteristics in respect of susceptibility to infection and activity level. These groups include men who have sex with men (MSM) and sex workers.

One approach to modelling social groups is to construct a pair approximation model. These models attempt to incorporate contact structure more accurately by modelling the effects of the disease process on the states of links between individuals.

In the first instance, we consider external infections on a single group. We then develop the model to include two groups with the potential for infection to occur between groups. Analytical and numerical solutions can be used to demonstrate the impact of external infections within a structured population. We also compare our findings to the results of computer simulations.