

## RESEARCH BASED TEMPLATE

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### **Investigating the bridging of heterosexual and homosexual behaviour networks on *N. gonorrhoeae* transmission through mathematical modelling**

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#### **Background:**

Evidence from genomic sequencing of *Neisseria gonorrhoeae* (NG) suggests that bridging between distinct sexual networks often occurs. The existence of bridging could expose more susceptible individuals to infection but could also provide an opportunity for more effective mitigation if bridging can be identified. We used mathematical modelling to investigate NG transmission dynamics in the presence of bridging between sexual networks, with the aim of investigating the impact on NG transmission in the entire population should a viable NG vaccine become available that can be targeted towards specific groups.

#### **Methods:**

We developed an individual-based model to capture the sexual contact and NG transmission networks within a population comprising a mix of heterosexual females, heterosexual males, men who have sex with men only, and men who have sex with men and women. The model was used to generate sets of transmission networks from an initial infected index case, over a one-year simulation, from which distinct NG transmission clusters were identified. Clusters were compared based on size and stratified into  $\leq 5$  (small) and  $> 5$  cases (large) and whether or not bridging between heterosexuals and men who have sex with men (MSM) occurred.

#### **Results:**

NG transmission clusters were identified and classified into those containing heterosexuals only, MSM only, or both. Most clusters were small (median of 2) but clusters as large as 19 were identified. Less than 5% of heterosexual-only clusters were large, while 20% and 28% of clusters containing only MSM or containing both were large, respectively.

#### **Conclusion:**

Our results suggest that large transmission clusters can be formed within a short time span, especially if bridging occurs between heterosexuals and MSM. Hence, targeted measures aimed at reducing STI transmission among MSM, such as offering vaccination to MSM population on presentation for STI testing, may help to reduce incidence and prevalence of infection in the overall population.

#### **Disclosure of Interest Statement:**

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