A social network analysis of a gonorrhea outbreak in Alberta, Canada

J Steven Raquel

12/07/2021

Outline

- Background
- Methods
- Discussion
- Conclusion

Background

- This dataset concerns a localised outbreak of *Neisseria gonorrehoeae* in an indigenous community located in Alberta, Canada. it was originally analyzed in a paper by P De, et al. (2004), in which they used measures of network centrality (e.g. information centrality) to determine the association between the risk of infection between members of the network and their position within the network itself.
- The network consists of 89 individuals, both male and female, 17 of whom were found to be patrons of a local bar in the area.
- This work expands upon the original analysis by looking at other types of network centrality such as eigenvector centrality, as well as applying exponential random graph modeling (ERGM) to the network in order to quantify the effect of various attributes of the network (e.g. gender, bar attendance).

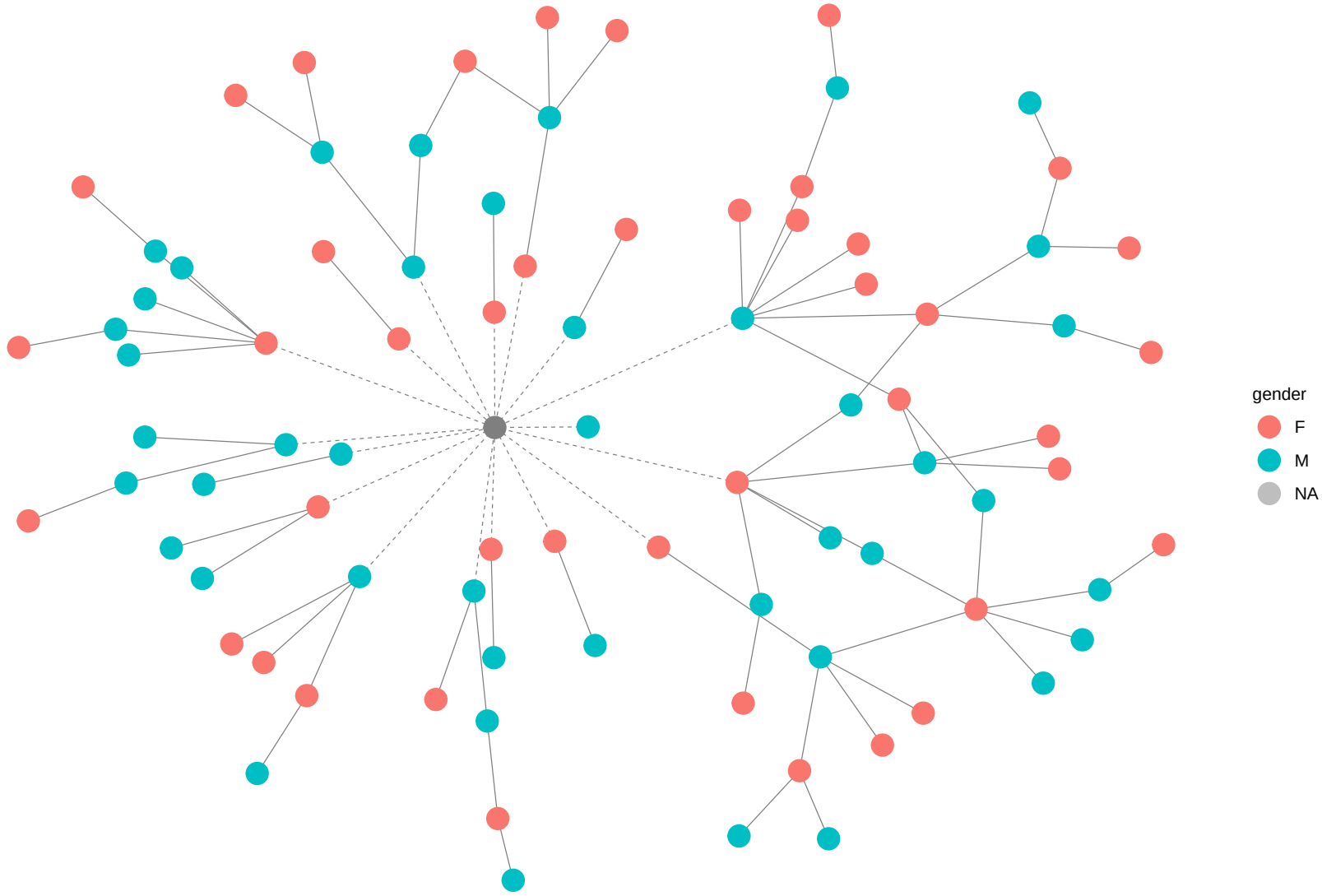
Background

- Gonorrhea is a sexually transmitted disease/infection (STD/STI) which can be transmitted orally, vaginally or anally.
- According to the Centers for Disease Control and Prevention, about 1 in 5 people in the United States have a STI, totalling nearly 68 million infections in 2018.
- Of the 26 million new infections in 2018, it is estimated about 1.6 million of them were gonorrhea.
- Although it can have many serious side effects, it can also be symptomless, leading to individuals unknowingly infecting their partners.

Background

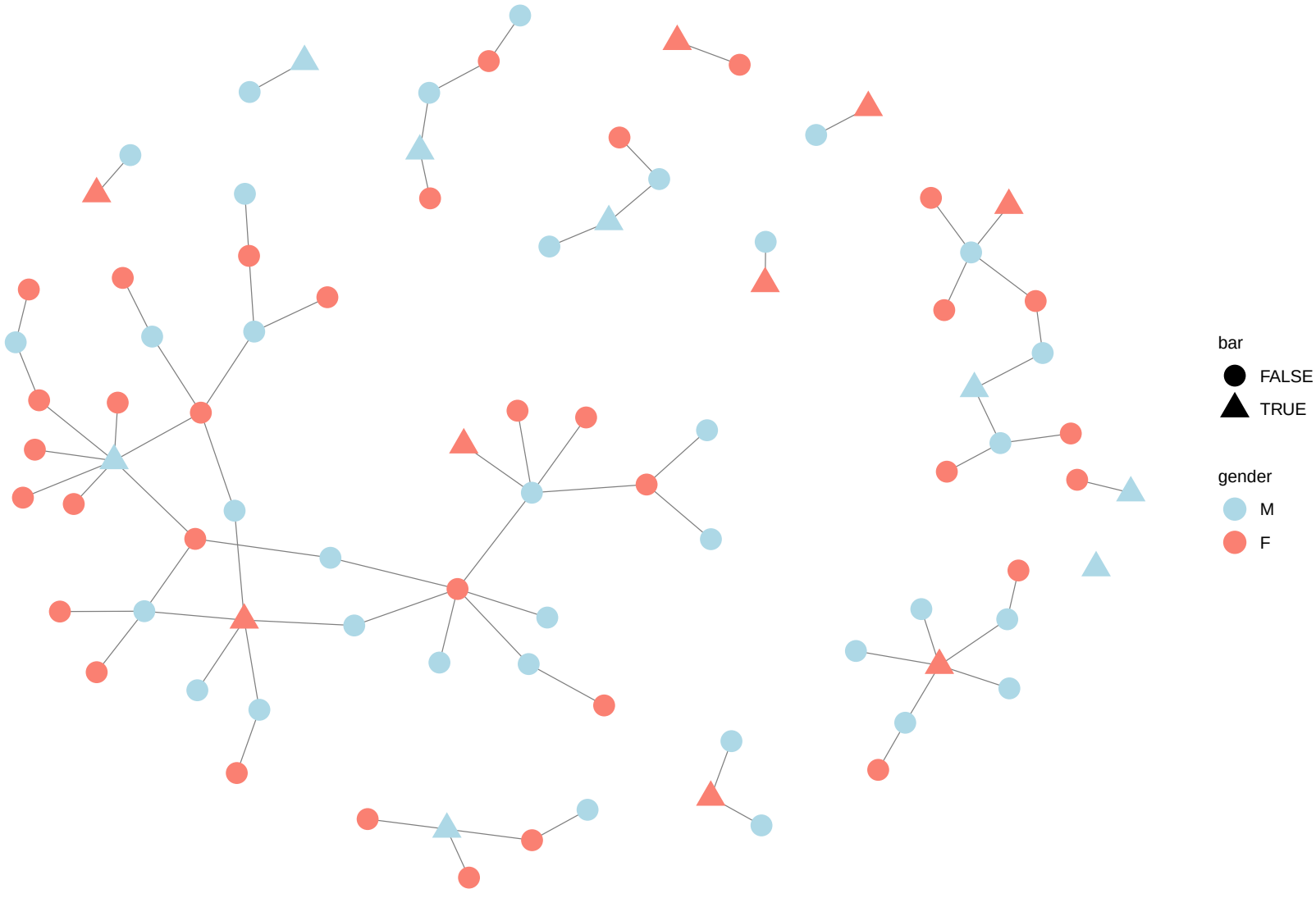
- Although the adjacency matrix for the data allowed us to analyze the network as a directed network, we thought it prudent to symmetrize the matrix (as was done in P De et al.)

The connected network with the bar as a node



- There are about 9 or so subcomponents of this graph; notice that the largest among them has 3 bar attendees within it, 2

The disconnected network without the bar as a node



Methods

- Degree Centrality
- Eigenvector Centrality
- Katz Centrality
- Average Distance
- Exponential Random Graph Model (ERGM)

Degree Centrality

-