THE EFFECT OF GEOGRAPHY ON SEXUALLY TRANSMITTED INFECTIONS

Tommi L. Gaines, Dr.P.H.
University of California, San Diego
Division of Global Public Health
Spatial Context of Sexually Transmitted Infections

- What is the role of space in shaping epidemics among high risk populations?

- Sex work spatially concentrated in certain neighborhoods (or red light districts)
Overview

Goal: Describe the application of a GIS model that examined the role of geography on sexually transmitted infections among sex workers enrolled in an epidemiological study occurring in Tijuana, Mexico

Challenge: How to capture enough spatial variation when examining a small area covering a few street blocks?
The Role of Space in Shaping Epidemics

Figure 1. Distribution of venues, sexually transmitted diseases (STD) prevalence by census tract, and density per 100 meters squared (inset) of STDs in the Zona Roja.
Tijuana’s Red Light District

- Sex work is quasi-legal and confined to specific neighborhoods designated as Zones of Tolerance
- Approximately 9,000 FSWs operate from a mixture of bars, nightclubs, hotels, and street corners
- Tijuana’s red light district or Zona Roja covers approximately 2.9 square kilometers
Limitations with Identifying Geographic Hotspots for STIs

- Rusch et al. found one area with prevalence higher than would be expected if HIV/STIs were randomly distributed.

- FSWs often work within a very short distance of one another (sometimes shoulder-to-shoulder).

- Difficult to identify geographic clusters of STIs within a short distance as these are more often found in large areas such as cities, counties, census tracts, or postal areas.
Does location of sex work effect likelihood of STIs?

Hypothesis:
There will be a decrease in the odds of HIV/STIs among FSWs working closer to the main sex strip, covering one-block street in the Zona Roja, where sex work is more commercialized and visible to authorities.
Geographic Data

- FSWs identified workplace where traded sex that was mapped in ArcGIS 9.2

- Tijuana Municipal Planning Institute provided digital map files of roadways

- Using ArcGIS measuring tool, manually calculated roadway distance between workplace and the main sex strip in the Zona Roja
Results from a Multivariable Logistic Regression

- For every 200 meters a FSWs worked from the center of the Zona Roja we observed a 41% increase in the odds of HIV, Chlamydia, and/or gonorrhea infection.

- Traveling a short distance from where sex work is most visible has a significant impact on HIV/STIs.
Conclusion

- Measuring distance captured more spatial variation and allowed us to identify geography as an independent correlate of HIV/STIs.

- By mapping work location we found which areas had a greater concentration of street-based sex workers who are more likely to experience increased risk for unsafe sex and drug activity.
Implications

- These geographic analysis are informative for spatially relevant prevention and support services.

- After study concluded, a mobile HIV prevention program targeting high-risk neighborhoods in the Zona Roja was implemented.
Future Challenges

- How can we incorporate the physical location of where high-risk behaviors are occurring into a simulation?

- NIH/NIDA K01 Career Development Award (K01-DA034523-01)- Develop a comprehensive simulation model to understand the underlying transmission dynamics of sexually transmitted infections. The simulation model will incorporate geographic information of where FSWs live and work.
  - How does movement in and out of the Zona Roja affect access to services and condoms, and ultimately likelihood of HIV/STIs?
Behavioral and Environmental Process affecting HIV/STIs

- Enforcement of Local Policy on SW
- Registration
- Expired Registration
- Relocation
- Unregistered FSWs in Zona Roja
- Registered FSWs in Zona Roja
- Unregistered FSWs outside Zona Roja
- HIV/STIs
- FSW access to Prevention Services
- FSW Condom Use
Acknowledgements

Collaborators:
M. Rusch, K. Brouwer, E. Perkins, T. Patterson, S. Strathdee.

Funding:
NIH/NIDA (R01DA027772-S1)

Selected Publications: