

Mapping Female HPV Cases in Honduran Municipios

Soomin Kim | Department of Geography, Dartmouth College | Nov. 2018



Abstract

Our client was the Norris Cotton Cancer Center (DHMC). We got data collected in Honduras at a factory and at one more rural location. The data included HPV screening results and the women's home municipios. We wanted to determine whether there was clustering of HPV female cases in certain municipios. To do this, we joined and summarized the data, found a ratio of positive results to total screenings, and then used Moran's I (global and local) to determine clusters of areas at high HPV risk.

Problem

Cervical cancer is a preventable and treatable disease, given early prognosis. Such prognosis can be done through HPV. Thus, it is important to detect HPV for prevention of cervical cancer.

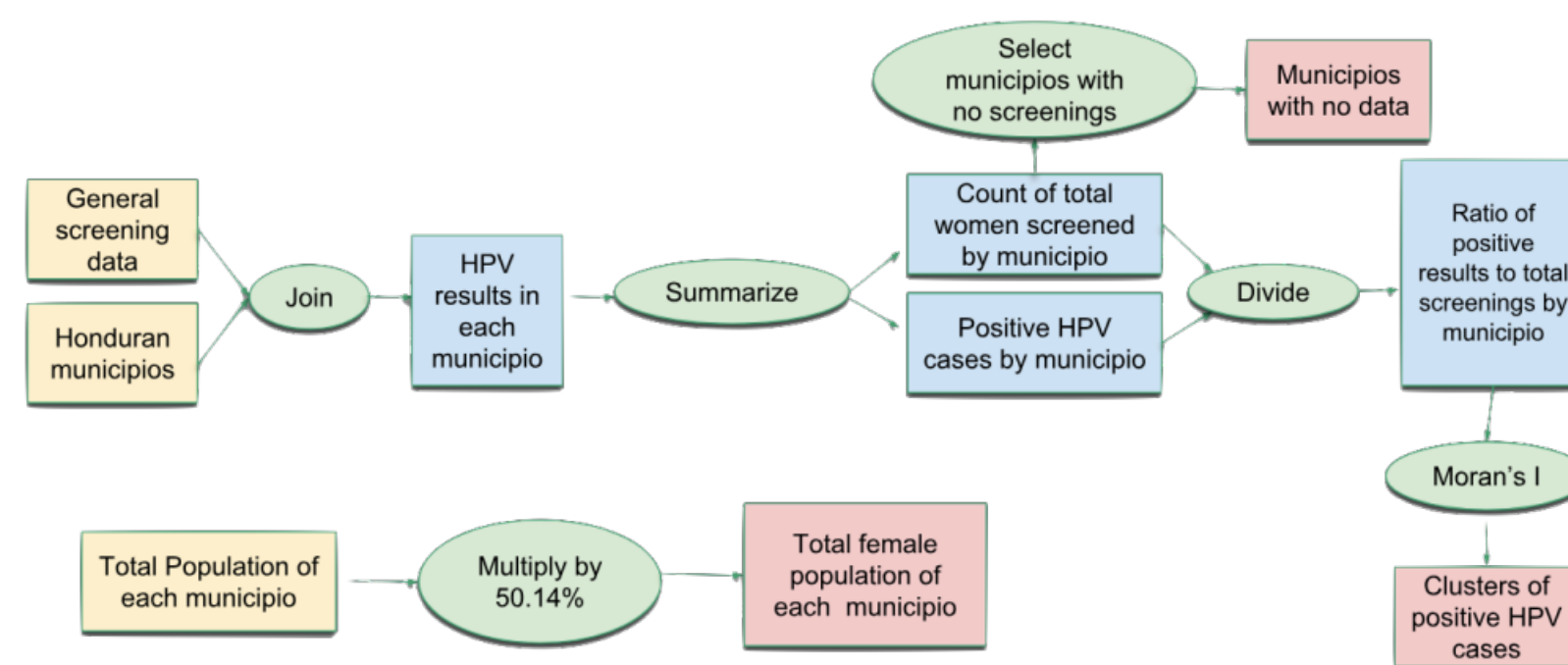
Over the last 10 years, there has been about 51% of HPV occurrences in Honduras, middle to low income areas with limited access to healthcare (NCBI). In this project, we aim to map the distribution of HPV occurrences, particularly in women, in each municipio. Then, we will identify and analyzed any concentrated areas or clusters (i.e. areas with high risk).

Data and Factors

- Data Collection
 - Location: "Jornada" : women from various communities getting pap tests
 - San Pedro Sula "maquila", big textile factory
 - Mosquitia, remote rural community
 - Year: 2013
 - Assumption: population has stayed the same since 2013
- Total Female Population (50.14%)
 - Assumption: total country's female demographic is evenly distributed within each municipio
- Missing Values
 - Municipios without screenings
 - Invalid HPV results (not enough DNA from pap tests)
 - Degradation of epithelial cells
 - Records with <NULL VALUES>

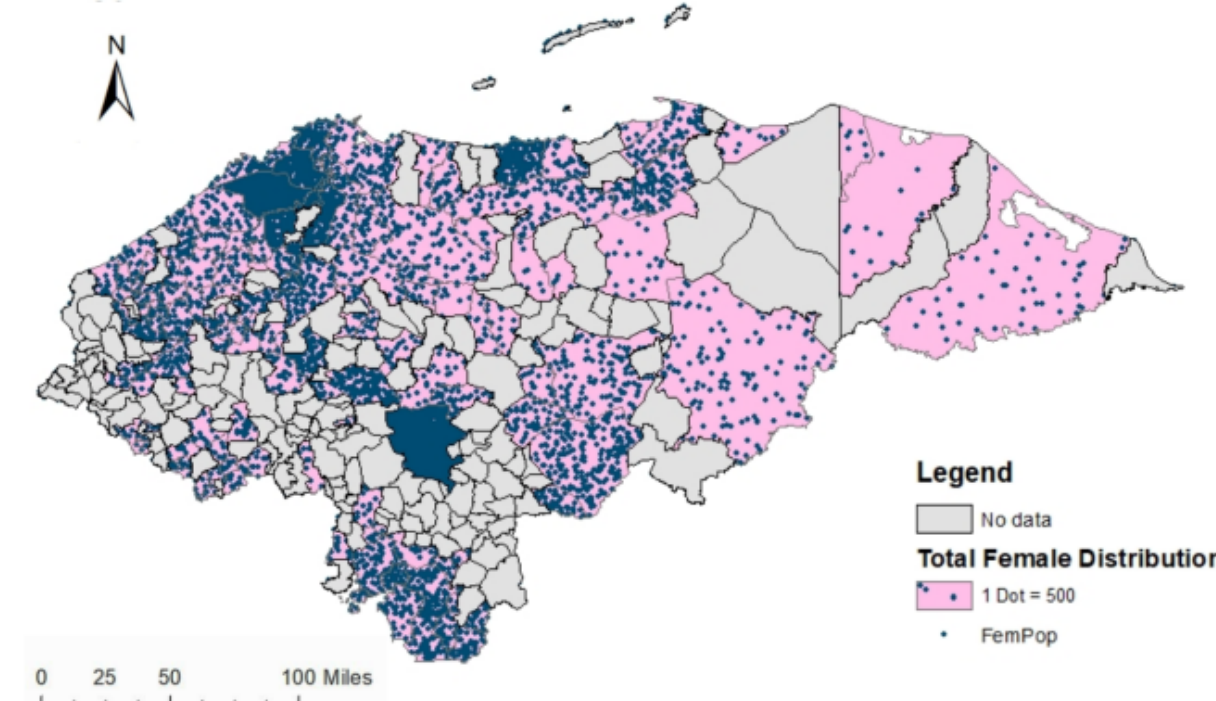
Methods

Joined DHMC data of screenings to shapefile of Honduran municipios w/ the municipio code as linking key. Summarized results by municipio to find counts of +HPV cases and total screenings. Calculated their ratio. Used Moran's I to find clusters. Researched the nat'l male: female ratio and applied it to data of total women by municipio to estimate women in each municipio.

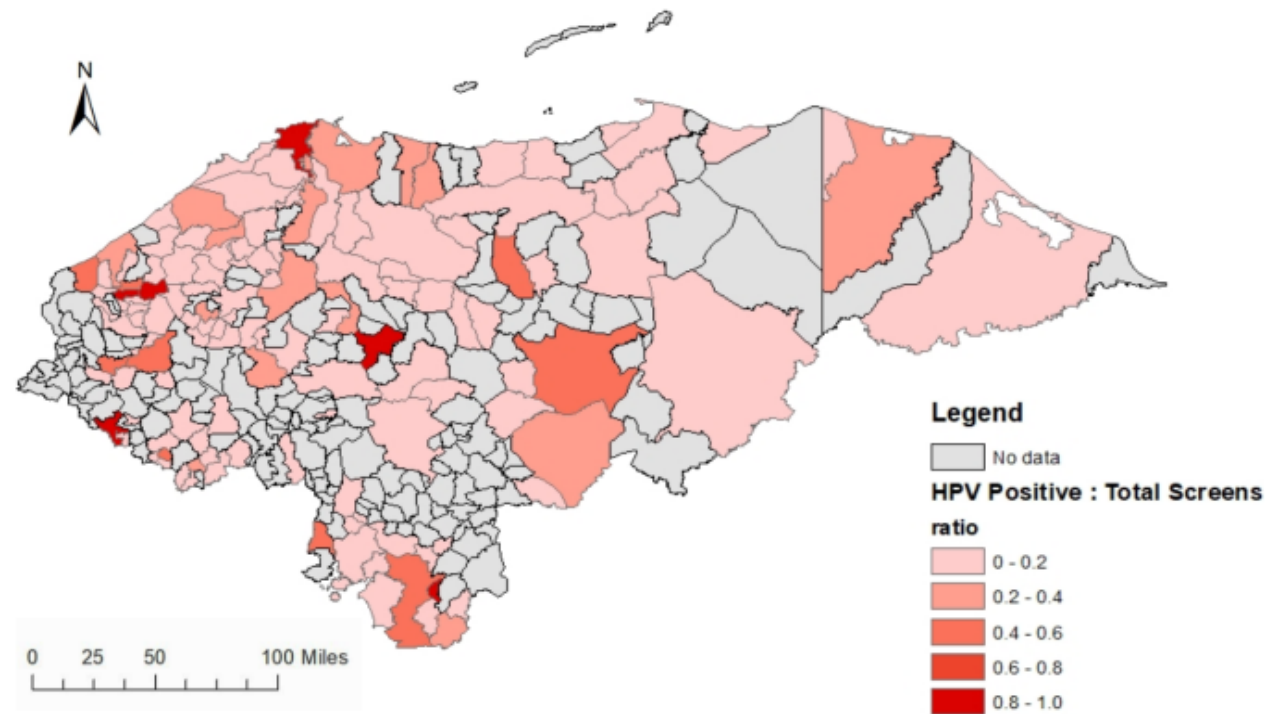


Results

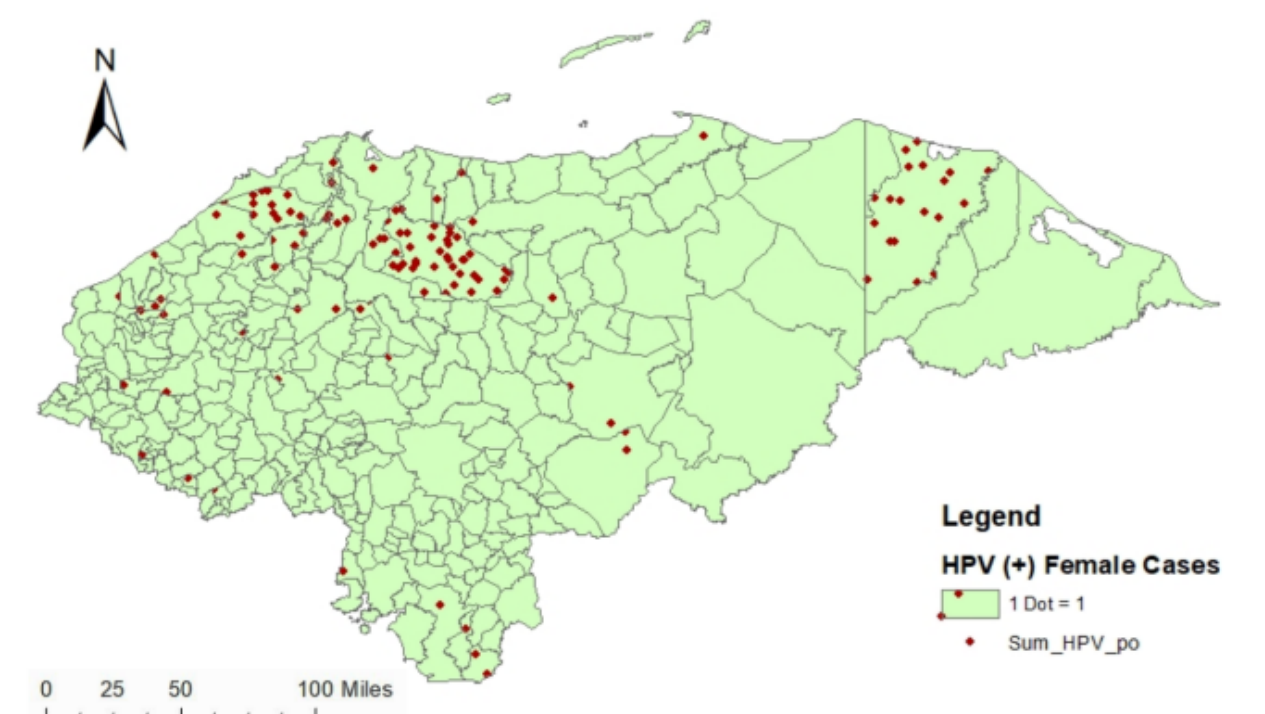
Total Female Population Distribution in Honduras in 2013



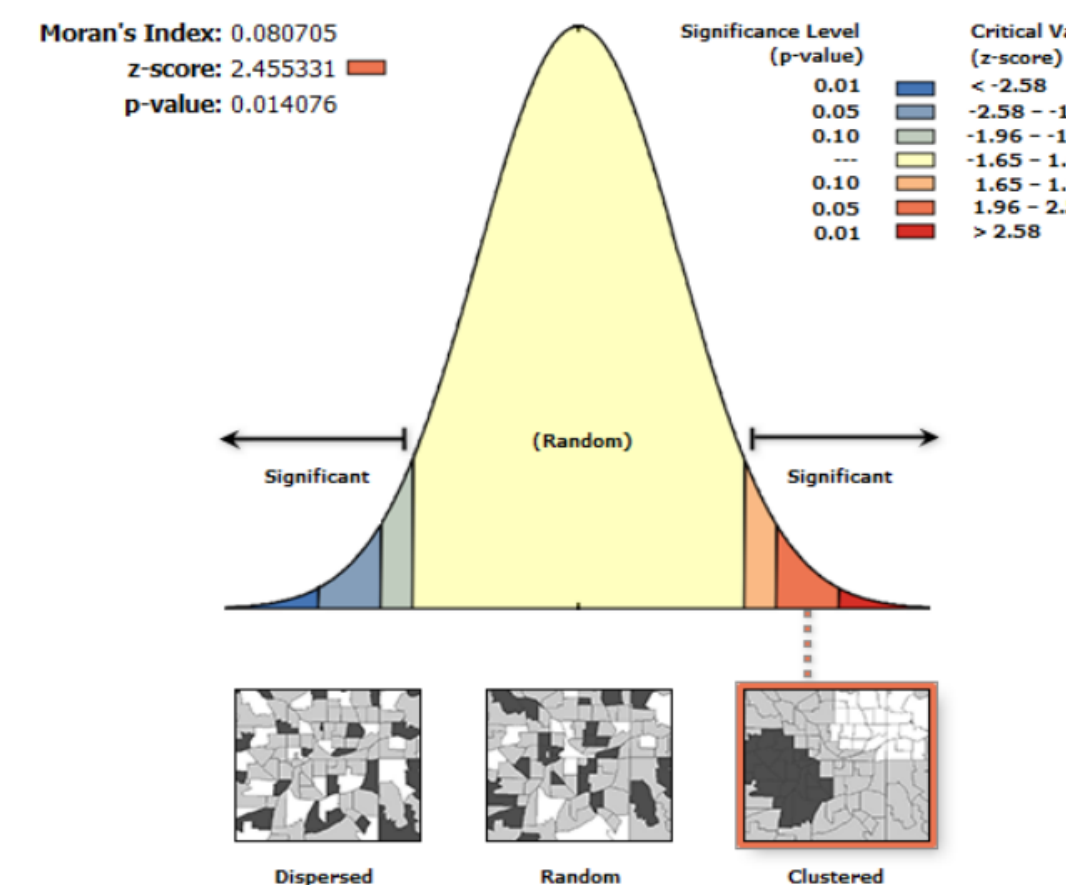
Ratio of HPV Positive Female Cases to Total Female HPV Screenings in Honduras in 2016



Distribution of HPV Positive Female Cases in Honduras in 2016

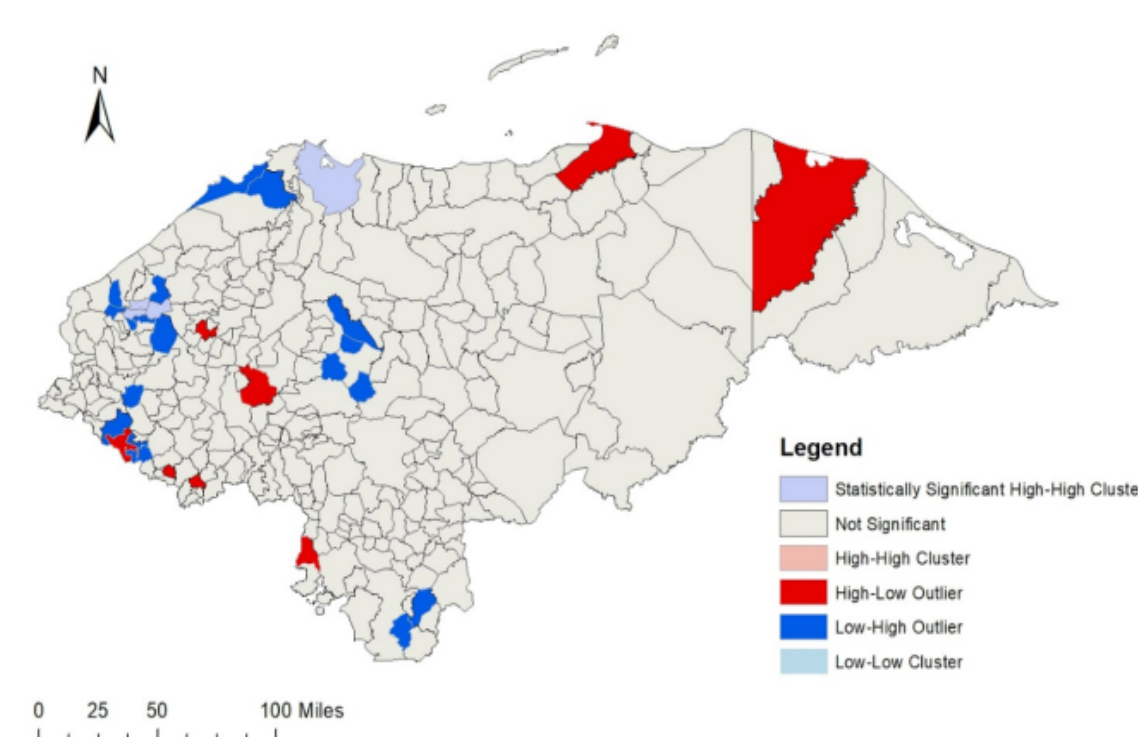


Spatial Autocorrelation Report

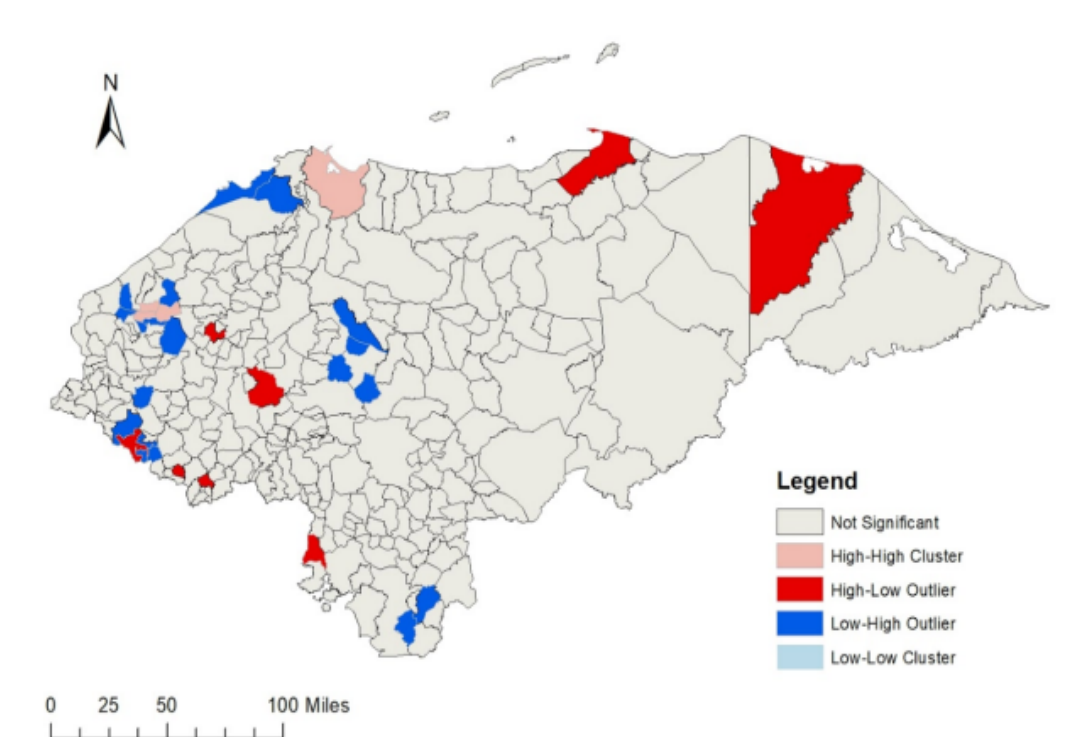


Given the z-score of 2.45533051202, there is a less than 5% likelihood that this clustered pattern could be the result of random chance.

Clustering of HPV Positive Female Cases to Total Female Screening Ratios in Honduras in 2016 (Moran's I Analysis)

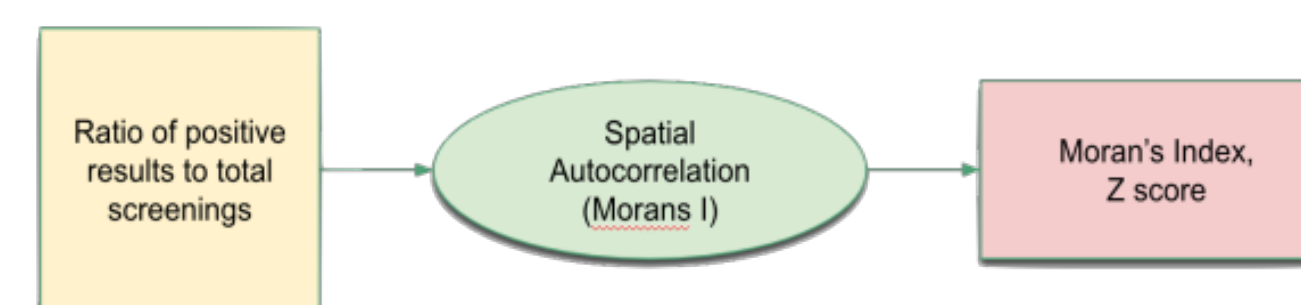


Clustering of HPV Positive Female Cases to Total Female Screening Ratios in Honduras in 2016 (Moran's I Analysis)

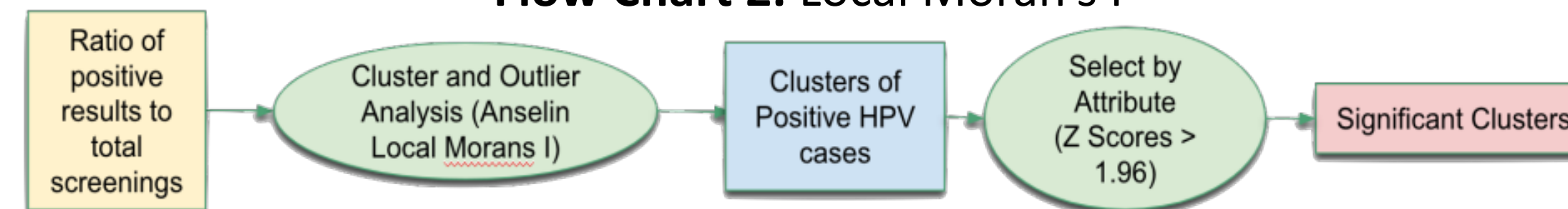


Maps immediately above show the overlaps of High-High cluster (left) and statistically significant areas (right)

Flow Chart 1. Global Moran's I



Flow Chart 2. Local Moran's I



Discussion and Conclusion

- Given the Z-score of 2.45533051202, there is a less than 5% likelihood that this clustered pattern could be the result of random chance.
- There were statistically significant local clusters of HPV female patients in certain regions of Honduras – including Tela, San Nicolas, Trinidad de Copan, Naranjito.
- For further research, our clients can focus on areas with high concentration of women or areas that lack screenings. Treatment can be distributed to clustered municipios of +HPV cases.
- Current data lacks HPV type information for each screening. Future data collection could ensure that HPV types are also recorded.

References

"Honduran Municipios 2016." Arcgis.com, 2016, www.arcgis.com/home/index.html.
Dartmouth Hitchcock Medical CenterNorris Cotton Cancer Center's (NCCC) global oncology initiatives
"National Center for Biotechnology Information." Current Neurology and Neuroscience Reports., U.S. National Library of Medicine, www.ncbi.nlm.nih.gov/.