The City Dweller at the Crossroads: The Intersection of Public Health Risks, Income Disparity, and Seismic Hazard in the Bay Area

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Background

In the Bay Area of California, public health hazards, socioeconomic disparities, and seismic activity intersect which poses multi-layered risks to the 7 million+ residents of the area.

Motivation

- To investigate the relationships between public health risks, socioeconomic indicators, seismic hazards, and income levels on regional and localized scales.
- To identify which disadvantages are most correlated in low-income census tracts.
- To inform regional and local policy-makers with actionable insights.

Data

- California Communities Environmental Health Screening
- UCSF Health Atlas
- Social Explorer Database
- Seismic Hazard Zone Maps and Evaluation Reports

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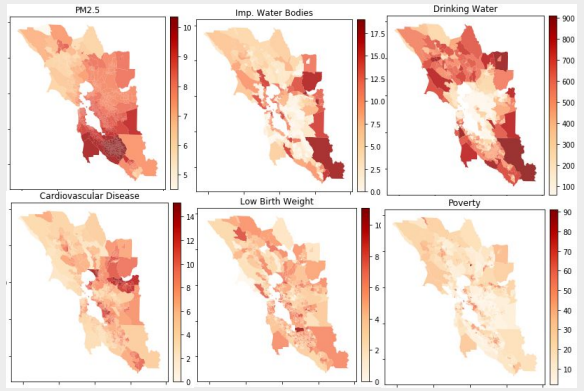
Exploratory Data Analysis



Probabilistic Seismic Hazard

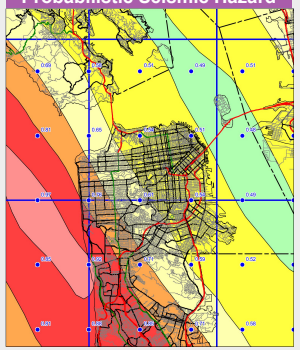
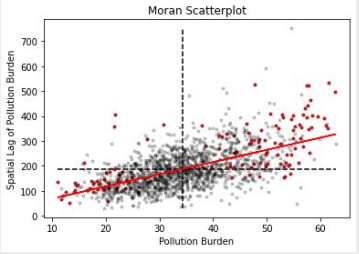


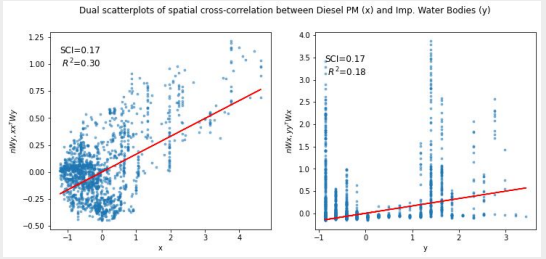
Figure 3: Peak ground acceleration (PGA) with 10% probability of exceedance in 50 years

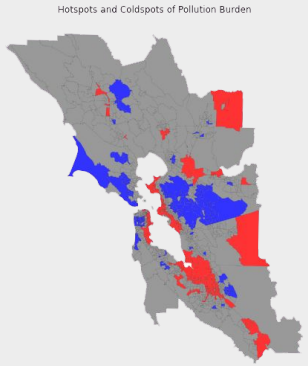
Spatial Correlation Analysis

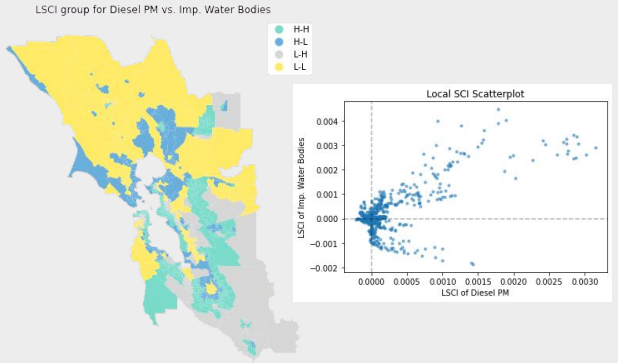
Autocorrelation



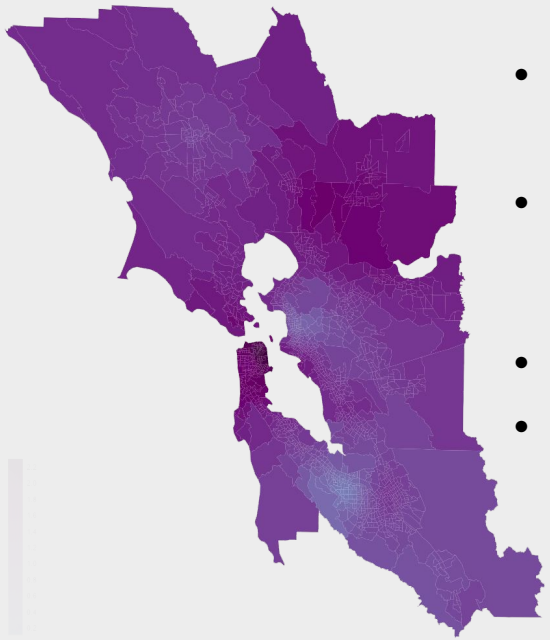
Cross-Correlation







Local Associations between Disease Burden and Poverty



- Using principal components analysis, we created an index of Disease Burden based on prevalences of 12 chronic conditions.
- Geographically weighted regression (GWR) model is able to examine local associations between various environmental and socioeconomic predictors on Disease Burden.
- Poverty was found to be positively associated with Disease Burden.
- The figure shows the coefficients for poverty. The darker the tract, the larger the correlation between poverty and disease burden.

Conclusion and Insights

- GWR model may be useful for local community leaders to know what to address specifically in order to reduce disease burden in their jurisdiction. Poverty was positively associated with disease burden, stressing poverty relief programs or access to affordable healthcare.
- Similarly, the spatial cross-correlation analysis reveals spatially-related pairwise interactions on environmental and socioeconomic factors and categorizes areas into groups with similar patterns. This may provide aid in policy making related to the control of these factors in terms of implementing similar strategies in areas with the same pattern and taking into account the potential influence any change in factors will have on the neighboring areas.

References

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