Relationship Between Incarceration Rates and Reported Mental Health per Census Tract in Chicago (2022)

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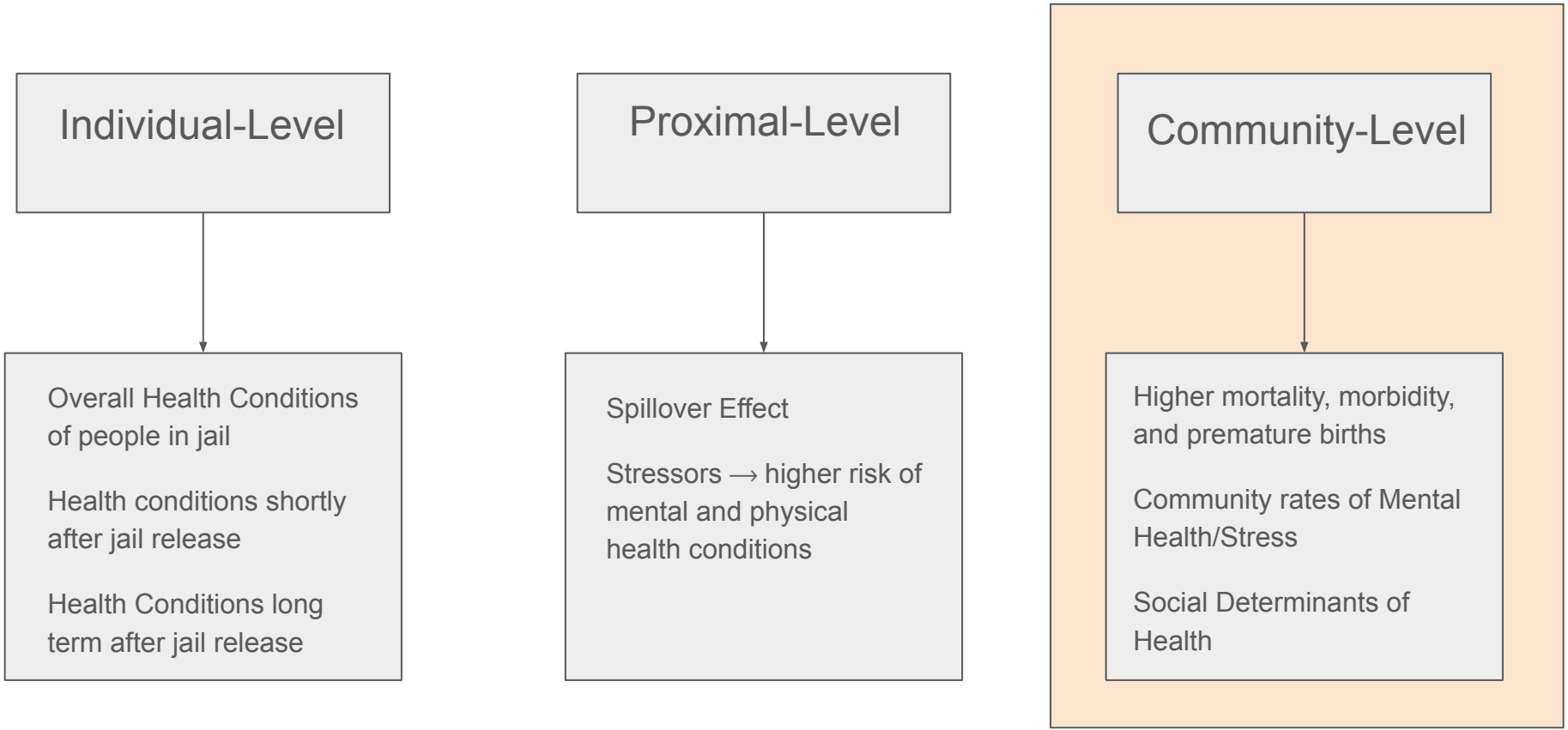
Research Objectives

Research Question

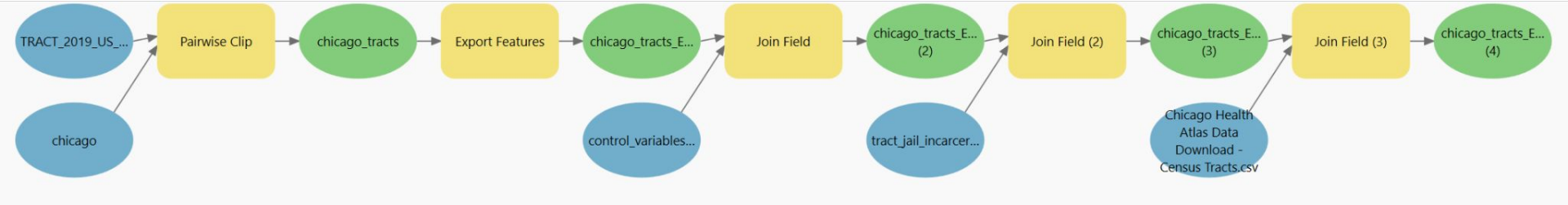
Do incarceration rates disproportionately impact neighborhood mental health rates in Chicago?

- Disproportionate effect and relationship strength
- Used to inform policy decision and urban planning
- Hypothesis: Higher neighborhood incarceration rates are associated with higher mental health rates, independent of income, unemployment, education, race, and age composition.
    - Stronger relationships in economically disinvested neighborhoods and communities of color, reflecting cumulative systemic disadvantage.

Literature: Incarceration and Health



Model Builder: Preliminary Processing



Data & Study Area

Incarceration Rates

Incarceration Rate per census tract as proportion of the total population
Format: csv

Opportunity Atlas 2010

Reported Mental Health Rates

Percent of resident adults who report 14 or more days in the past month when their mental health was not good
Format: excel

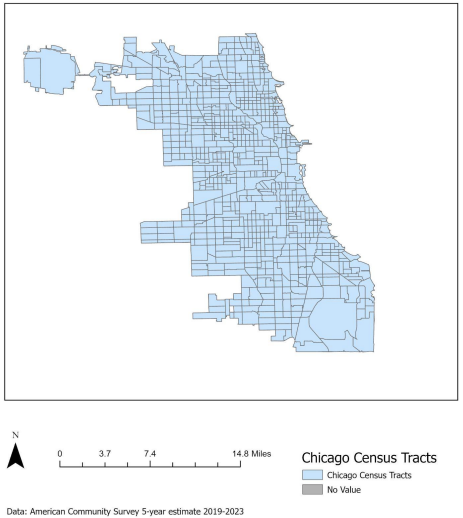
Chicago Health Atlas 2022

Sociodemographic census tract data

Geographic Boundaries, Poverty, Race, Unemployment, Educational Attainment, Age/sex
Format: csv, shapefile

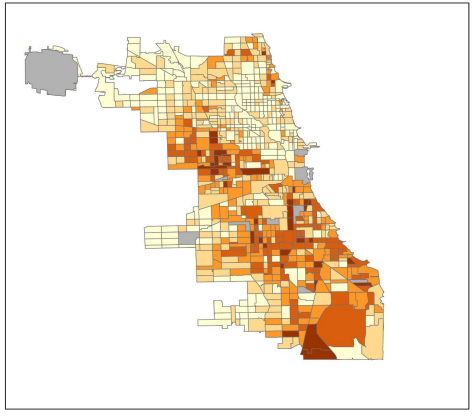
American Community Survey 5-year estimate 2019-2023

Chicago Census Tracts 2020

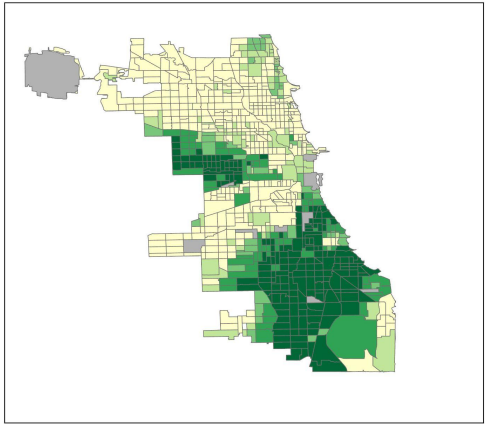


Descriptive Maps

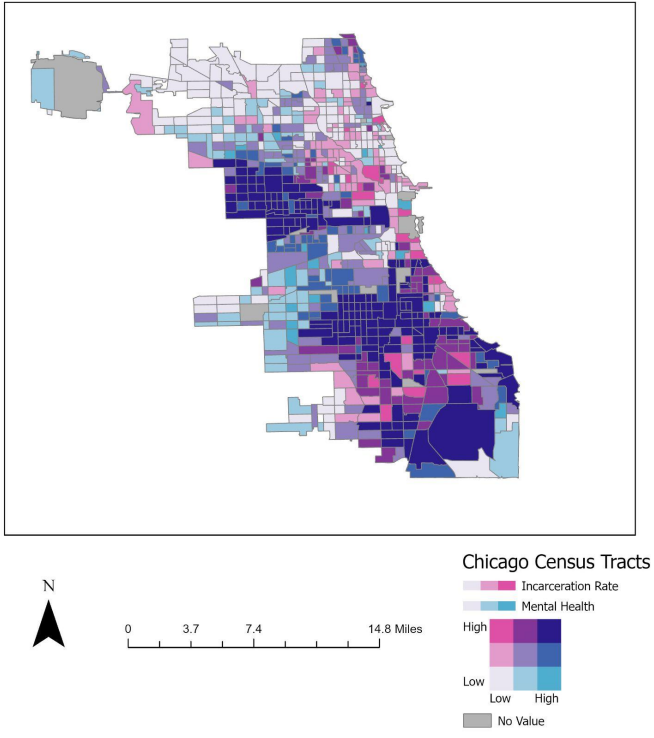
Proportion under the Poverty Line per Chicago Census Tract in 2022



Percent that identifies as Black/African American per Chicago Census Tract in 2022



Association between Incarceration Rate and Reported Mental Health per Census Tract in Chicago in 2022



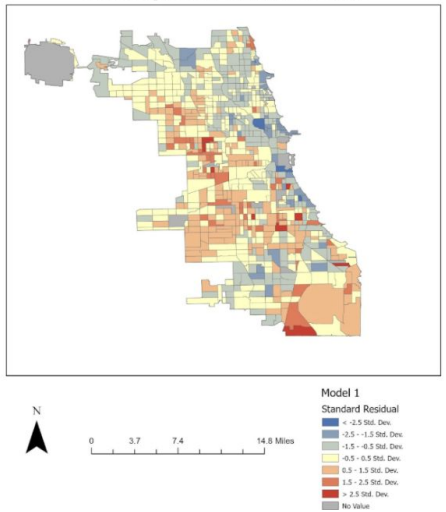
Major Methods: Regression

Model 1 — Bivariate: $MR_t = \beta_0 + \beta_1(IR_t) + \epsilon_t$

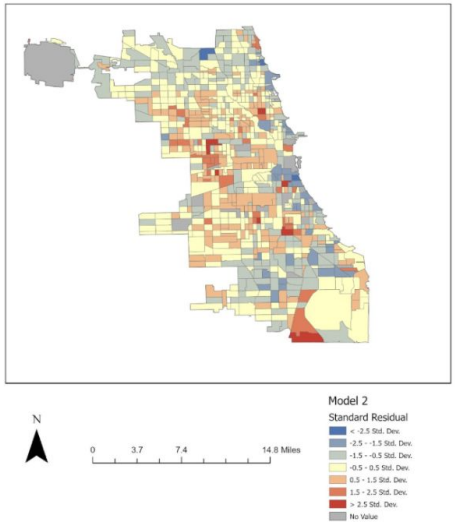
Model 2 — Socioeconomic Adjustment: $MR_t = \beta_0 + \beta_1(IR_t) + \beta_2(MedianIncome_t) + \beta_3(UnemploymentRate_t) + \epsilon_t$

Model 3 — Full Demographic Adjustment: $MR_t = \beta_0 + \beta_1(IR_t) + \beta_2(MedianIncome_t) + \beta_3(UnemploymentRate_t) + \beta_4(ControlVariables_t) + \epsilon_t$

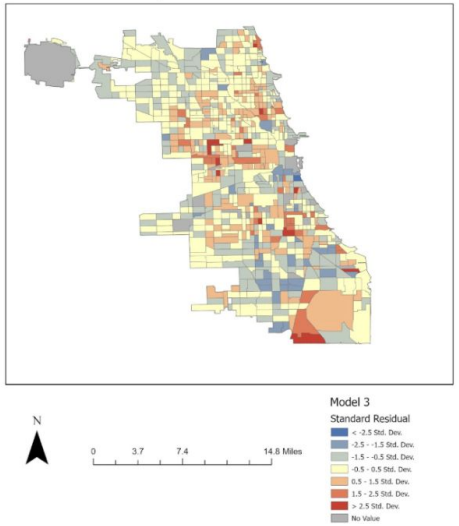
Ordinary Least Square Regression Model 1: Relationship between Incarceration rates and Reported Mental Health

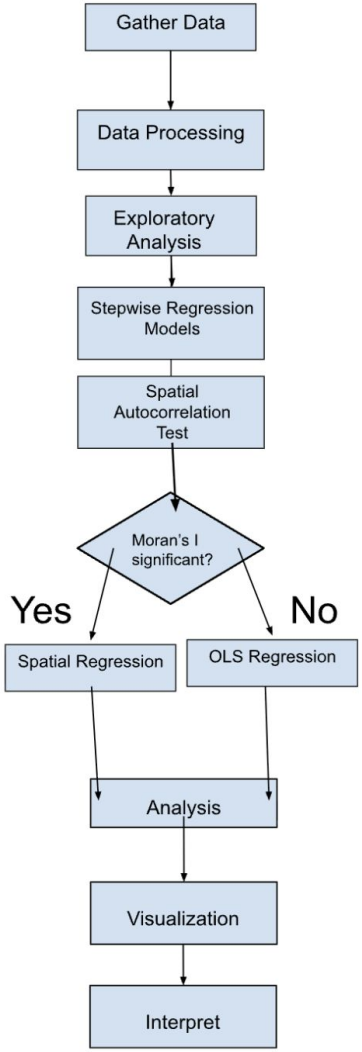


Ordinary Least Square Regression Model 2: Relationship between Incarceration rates and Reported Mental Health



Ordinary Least Square Regression Model 3: Relationship between Incarceration rates and Reported Mental Health



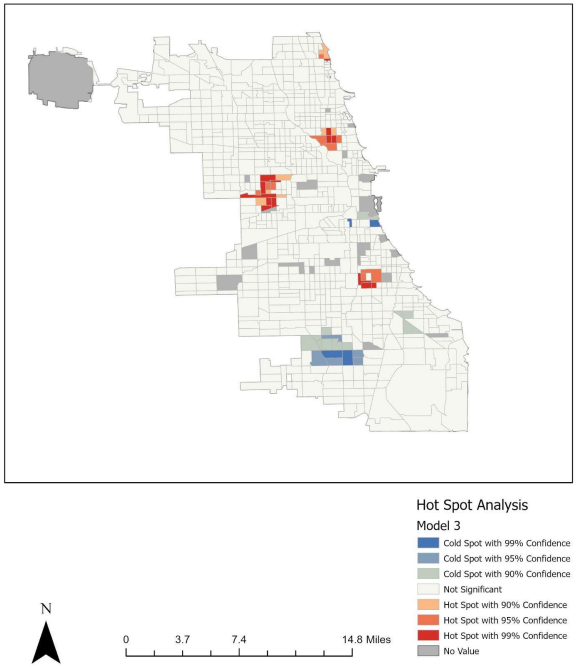


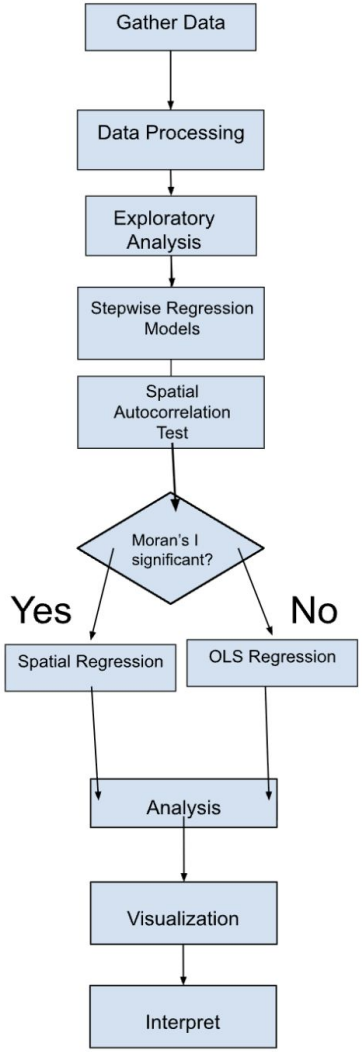
Major Methods: Moran's I

Global Moran's I Summary

Moran's Index	0.235677
Expected Index	-0.001292
Variance	0.000428
z-score	11.452283
p-value	0.000000

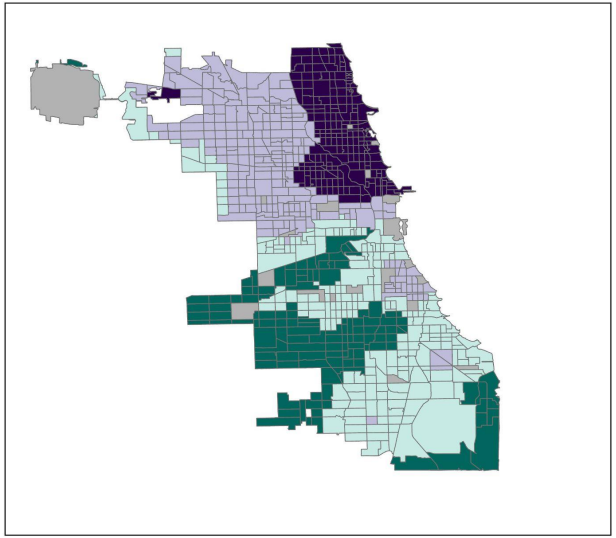
Hot Spot Analysis:
Relationship between Incarceration rates and Reported Mental Health

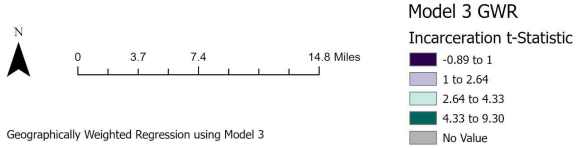




Major Methods: GWR

Geographically Weighted Regression based on Incarceration Rates and Mental Health Rates | Chicago Census Tracts



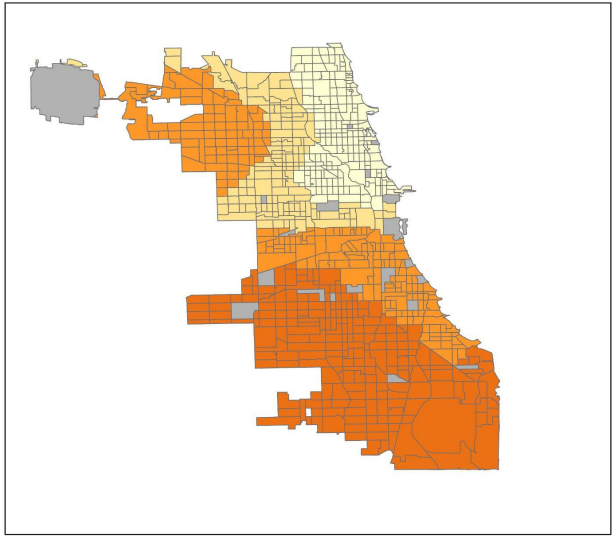


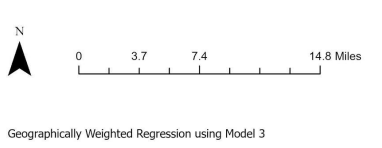
Model 3 GWR
Incarceration t-Statistic
-0.89 to 1
1 to 2.64
2.64 to 4.33
4.33 to 9.30
No Value

Geographically Weighted Regression using Model 3

Variable: T-Statistic and significance of Jail Incarceration to Mental Health Rates

Geographically Weighted Regression based on Incarceration Rates and Mental Health Rates | Chicago Census Tracts

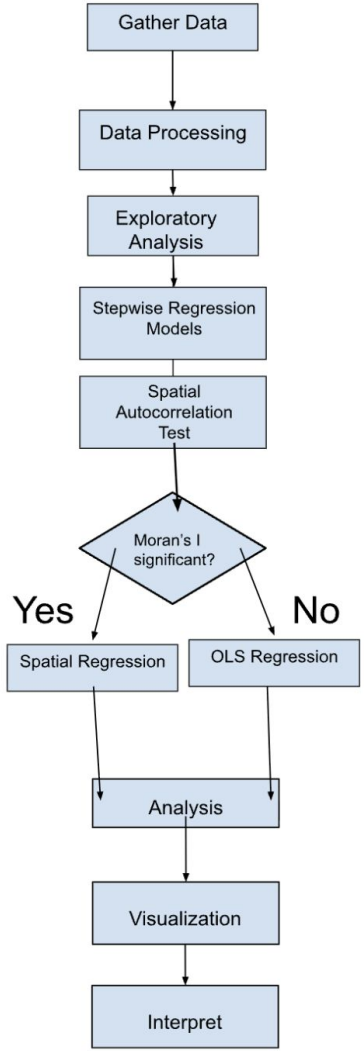




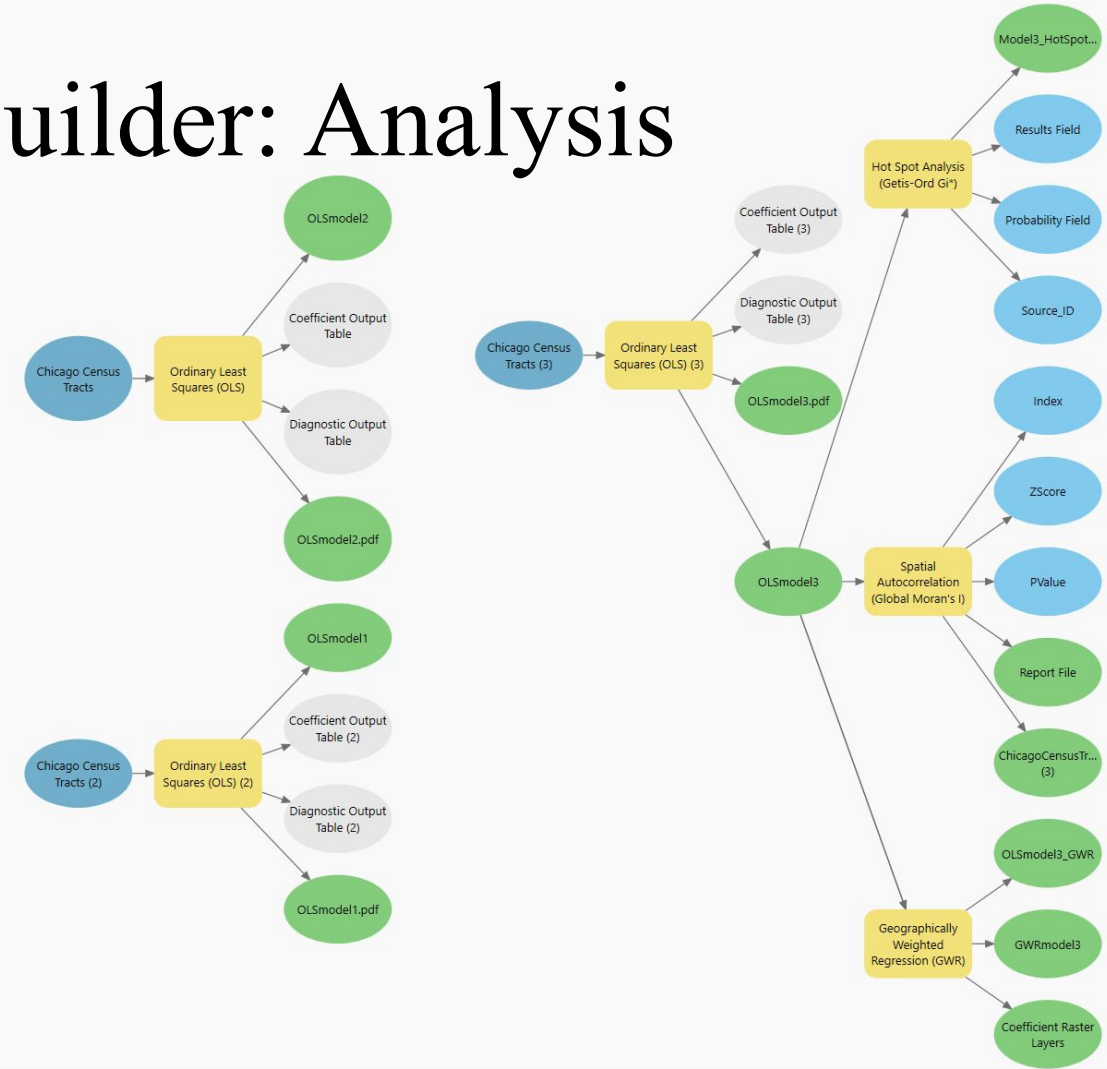
Model 3 GWR
Jail Incarceration Coefficient
-0.20 to 10.47
10.5 to 19.9
19.9 to 28.70
28.70 to 38.61
No Value

Geographically Weighted Regression using Model 3

Variable: Predicted Coefficient of Jail Incarceration to Mental Health Rates



Model Builder: Analysis



Discussion and Conclusions

- **Significant relationship between incarceration rates and mental health rates on the census tract especially in the south side of chicago, where incarceration rates tend to be higher**

- GWR takes into account spatial relations- the rates of the tract is impacted by the tracts around it

Limitations

- Confounding variables we might have have not accounted for that impact both incarceration rates and mental health rates
- Limited to Chicago census tracts
- Mental health rate is self-reported, not fully representative, and limited

Further Research

- Conduct sensitivity analysis
  - Different neighbor metrics
  - Removing controls
  - Missing data
- Robustness testing
  - Checking for outliers
- Alternative Outcome Measures

Sources

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