The Association of Crime Occurrence on Rates of Suspensions and Expulsions in Chicago Public Schools Using Poisson Regression

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Motivation

- **Goal:**
  - To gain a better understanding of factors that may influence student explusion
- **Steps:**
  - Investigate potential factors leading to student expulsion
  - Analyze the effects of the amount of violent crime in a school attendance boundary
  - Examine spatial effects of school attendance boundaries

Model

Count Data Modelled Using a Poisson Distribution

$$y_i \sim Poisson(\lambda) \quad (1)$$

Priors for Beta and Alpha Parameters

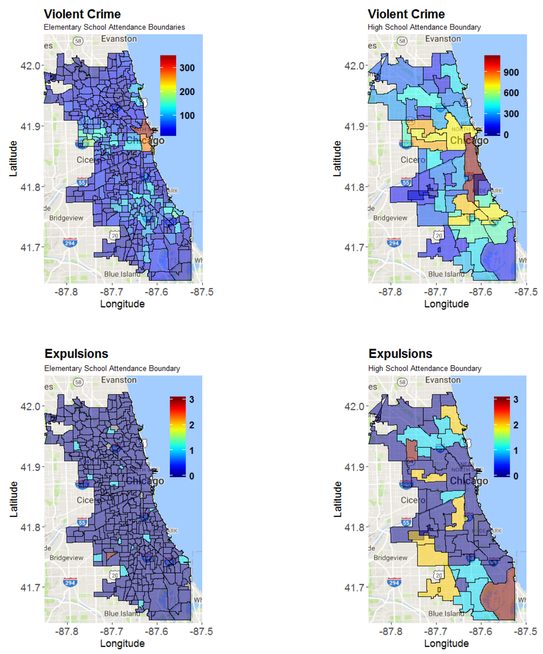
$$\begin{aligned} \beta_j &\sim Normal(0, 100) \\ \alpha_i &\sim Normal(0, 1000) \end{aligned} \quad (2)$$

Poisson Regression Model

$$\begin{aligned} log(\mu_i) &= log(n_i) + \alpha_i + \mathbf{X}\beta \\ \mathbf{X}\beta &= \beta_0 + X_1\beta_1 + ... + X_n\beta_j \end{aligned} \quad (3)$$

Data

- Chicago Data Portal
  - Chicago Crime Records for the year 2015
  - Shapefiles for CPS attendance boundaries
- Chicago Public School Data from the CPS Website
  - Attendance records
  - Education quality scores
  - Standardized test scores
  - Suspension, expulsion, and misconduct information



Model Variables and Results

Response data:

Expulsions → Expulsions counts for each Chicago Public School

Environmental covariates:

$\mathbf{x}_1 - \mathbf{x}_5$ = Ethnicity counts for schools; White, African American, Native American, Hispanic, Multiethnic, and Asian respectively

$\mathbf{x}_7$ = Number of misconducts per school

$\mathbf{x}_8$ = School quality score (Elemetary School Model)

$\mathbf{x}_9$ = PARCC average math score (Elementary School Model)

$\mathbf{x}_{10}$ = PARCC English Language Arts average score (Elementary School Model)

$\mathbf{x}_{11}$ = Crime counts based on school attendance boundary (Elementary School Model)

$\mathbf{x}_8$ = Average ACT composite score per school (High School Model)

$\mathbf{x}_9$ = Crime counts based on school attendance boundary (High School Model)

$\mathbf{x}_{10}$ = School quality score (High School Model)

Discussion of Results

Current Work & Future Considerations

Acknowledgements