Assessing the Impact of Critical Mass in Chicago Public Schools

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Research Question: What is the impact of teacher racial diversity on student educational outcomes?

Key Definitions

Research Question: What is the impact of teacher racial diversity on student educational outcomes?

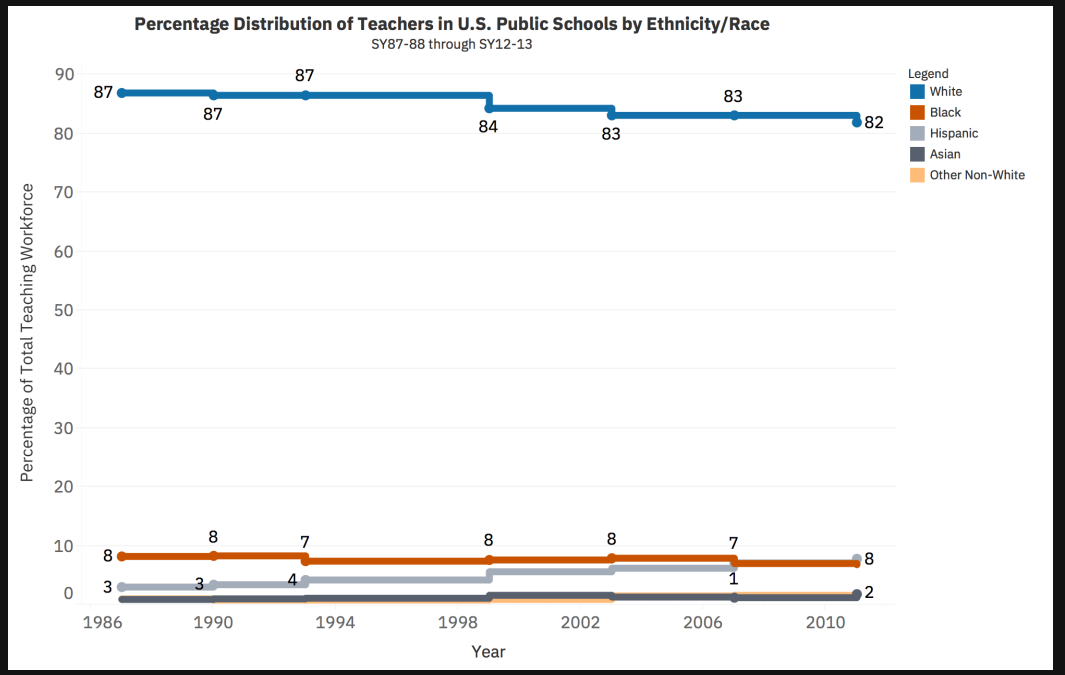
Critical Mass

A minimum amount or threshold required to realize a certain outcome

Student Outcomes

Measures of student achievement or success, e.g. test data (attainment or growth), graduation rates, ***college persistence rates***

Motivation



Data Source: National Center for Education Statistics

Racial makeup of public school teachers (K-12) has remained relatively stagnant

Public School students have been majority non-white since 2015.

Existing Research

Critical masses of ...

... **women** in corporate or political spheres (Kanter 1977; Dahlerup 1988); women in police departments (Meier et al. 2006)

... **African-Americans** in local elected offices (Meier et al. 1991; Goode and Baldwin 2005)

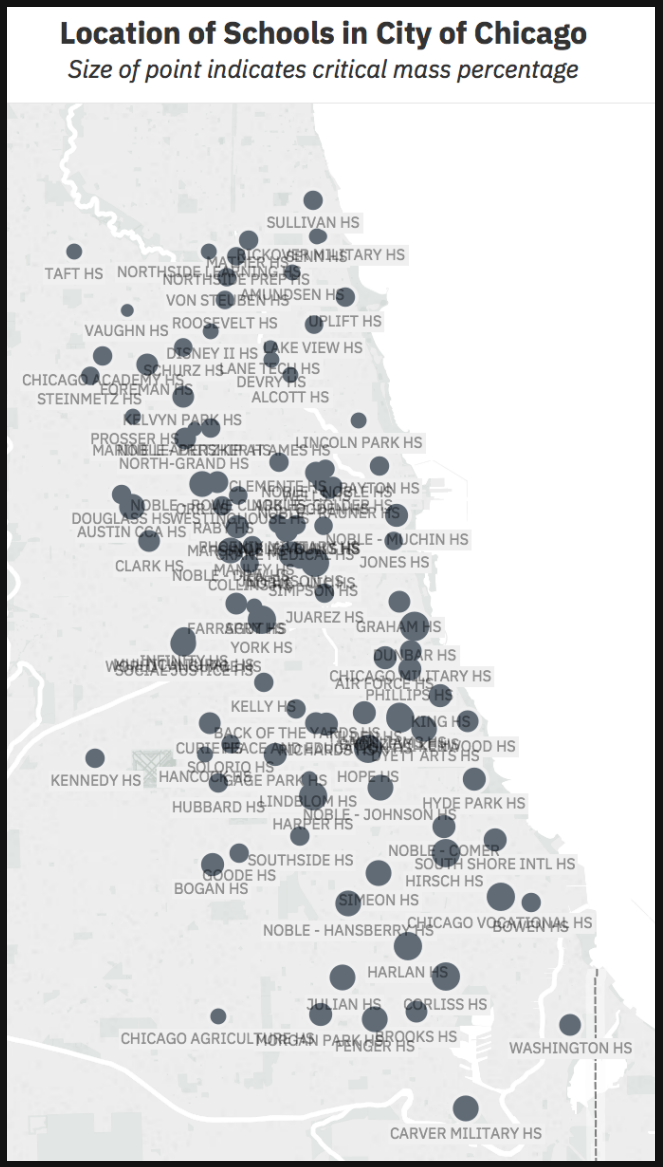
... **people of color** in managerial positions (Choi 2013)

In Schools...

... **latinx** school administrators linked to improved outcomes to latinx students (Meier 1993)

... **teachers of color** expectations of students of color; role-model effect; culturally relevant curriculum (Grissom et al. 2015; Nicholson-Crotty 2011; Dee 2005; Cole 1986)

Data



Data Source: City of Chicago

This paper's contribution:

Examine the effects of critical mass at a school-level on longer-term student outcomes such as college retention rates

Data Sources:

1. Teacher Demographics: Freedom of Information Act (FOIA) for Chicago Public High Schools (CPS); Requested from a charter school network
2. Student Outcomes Data: open data from CPS

107 Public and Charter High Schools

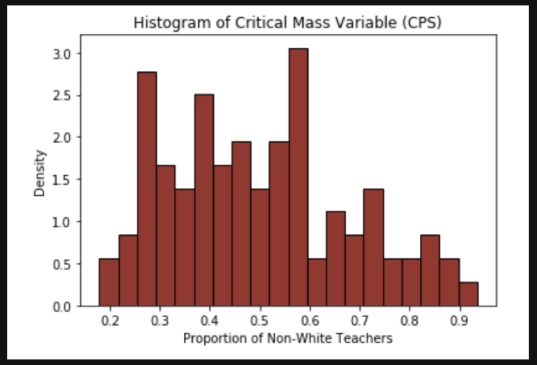
- 5,940 classroom teachers employed
  - ~50% self-identify as white
  - ~25% self-identify as black
  - ~16% self-identify as latinx
  - ~4% self-identify as Asian
- 85,743 students enrolled
  - CPS Students are 90% non-white

Building the Model

Dependent Variable:
College Persistence Rate of graduates from each high school

Independent Variable:

The percentage of non-white teachers in a given high school (critical mass)



Controls:

Student Race/Ethnicity Demographics; Free-Reduced Lunch Rates (FRL); English Language Learners (ELL), Special Education (SPED)

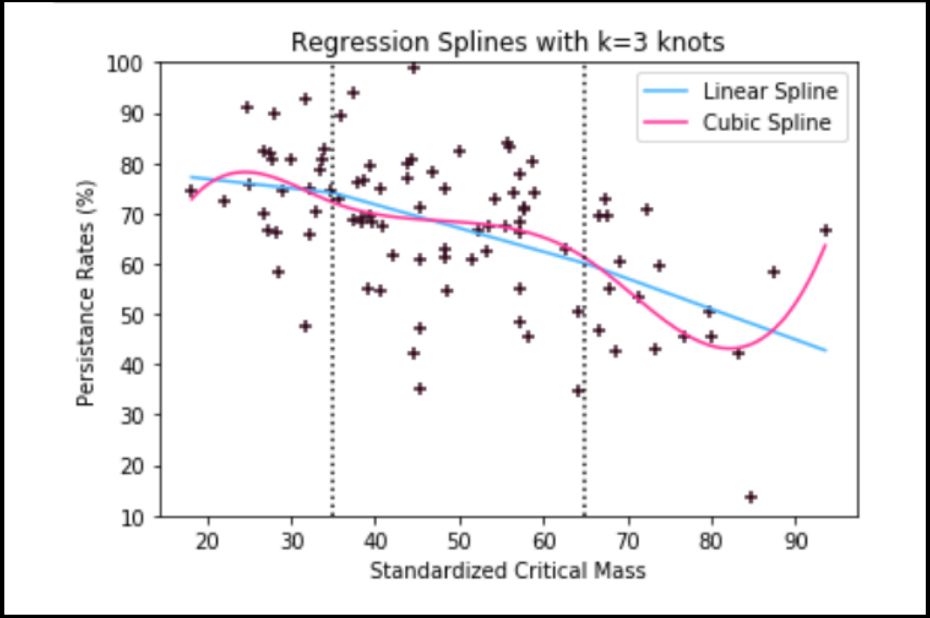
OLS Regression

$$Persistence = \beta_0 + \beta_1\, CriticalMass + \beta_2 ELL + \beta_3 SPED + \beta_4 \mathrm{FRL} + \beta_5 White + \beta_6 Black + \beta_7 Native + \beta_{82}\mathrm{Latinx} + \beta_{92} MultiRace + \beta_{10,2} Asian + \beta_{11,2} HIPI + \varepsilon$$

	Coefficient	Standard Error	p-value
Intercept	61.0935	86.162	0.480
Critical mass	-0.0972	0.090	0.285
White	0.2493	0.886	0.779
Black	0.7255	0.889	0.417
Native Am/Alaskan	2.6210	4.462	0.559
Latinx	0.8458	0.899	0.350
Multiracial	1.5121	2.129	0.480
Asian	1.35	1.045	0.217
HI/PI	-6.2264	5.330	0.246
ELL	-0.0872	0.173	0.617
SPED	-0.1950	0.169	0.252
FRL	-0.7199	0.206	0.001

Regression Splines

$$Persistence = \begin{cases} \beta_{01} + \beta_{11}\, CriticalMass + \beta_{21} ELL + \beta_{31} SPED \\ +\beta_{41} \mathrm{FRL} + \beta_{51} White + \beta_{61} Black + \beta_{71} Native \\ +\beta_{81} \mathrm{Latinx} + \beta_{91} MultiRace + \beta_{10,1} Asian + \beta_{11,1} HIPI + \varepsilon & if\ CriticalMass \leq 35 \\ \beta_{02} + \beta_{12}\, CriticalMass + \beta_{22} ELL + \beta_{32} SPED \\ +\beta_{42} \mathrm{FRL} + \beta_{52} White + \beta_{62} Black + \beta_{72} Native \\ +\beta_{82} \mathrm{Latinx} + \beta_{92} MultiRace + \beta_{10,2} Asian + \beta_{11,2} HIPI + \varepsilon & if\ 35 > CriticalMass < 65 \\ \beta_{03} + \beta_{13}\, CriticalMass + \beta_{23} ELL + \beta_{33} SPED \\ +\beta_{43} \mathrm{FRL} + \beta_{53} White + \beta_{63} Black + \beta_{73} Native \\ +\beta_{83} \mathrm{Latinx} + \beta_{93} MultiRace + \beta_{10,3} Asian + \beta_{11,3} HIPI + \varepsilon & if\ 65 \leq CriticalMass \end{cases}$$



Some Reflections

Other Student Outcomes…

- PSAT/SAT Attainment/Growth
- Suspension/Expulsion Rates

Also…

- Small *n*
- Questionable reliability of college persistence data
- Non-representativeness of Chicago teaching workforce relative to nation & previous studies
- Racial Solidarity assumed (Fields and Fields 2015; Reed 2006)

Next Step: Multivariate Adaptive Regression Spline (MARS)

$$f(X) = \beta_0 + \sum_{M=1}^{M} \beta_m h_m(X)$$

$$=$$

$$\hat{\beta}_{M+1} h_l(X) \times (X_j - t)_+ + \hat{\beta}_{M+2} h_l(X) \times (t - X_j)_+, h_l \in M$$