

Public Libraries and Inequality in Education

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39th Annual Meeting EEA 2024

August 27, 2024

Why Care about Public Libraries?



PUBLIC LIBRARIES

LIBRARIES
Why they're under attack, and what the consequences might be



THE FIVE

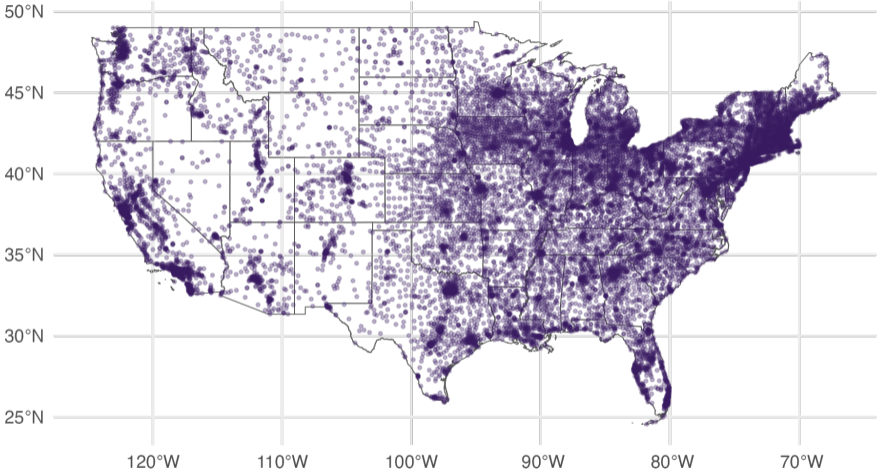
LIBRARIES TURNING INTO DRUG-INFESTED, SEX DENS

FOX NEWS channel

Why Care about Public Libraries?

- Libraries are essential social infrastructure that offer one of the few **indoor spaces for free and open to all** (Klinenberg 2019)
- Libraries might be an important **tool to mitigate inequalities**
 - libraries increase the amount of time children spend reading, reduce children's television consumption, and **increase homework completion rates** (Bhatt 2010)
 - when libraries stay open for longer hours, **crime rates decline** (Porter 2015)
 - Economic historians find that the expansion of public libraries in the U.S. was **driven by urbanization and a diverse migrant population** (Kevane and Sundstrom 2014)

Public Libraries in the United States (2018)



Data: Public Library Survey 2021

Research Question and Related Literature

My Research Interest: How do public libraries affect communities in the United States? Specifically, how did public library branch closures influence children's educational outcomes between 2009 and 2018?

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- Related Literature:
-

Research on libraries in economics:

- libraries and education (Gilpin, Karger, and Nencka 2023; Bhatt 2010)
- library programs (Ferreira Neto 2023)
- library opening hours (Porter 2015)

Data

Public Library Survey (PLS)

- PLS offers annual data on the **near-universe of public libraries** in the U.S with a response rate of around 97 %
- Rich information on finances and usage, as well as openings and closings of libraries and branches
- Includes **exact geo-location** of each library unit
- In 2018, there were 9,249 public libraries on the United States' mainland

Table: Library Closures between 2009 and 2018

Library Outlet	No. of Closures
Branch Library	369
Bookmobile	215
Central Library	93
Other	3
All	680

Educational Outcomes

Educational Opportunity Project at Stanford University (SEDA):

- collects **standardized test scores** for school districts in the U.S. annually
 - federal law requires public schools to perform yearly, standardized tests for Math and Reading from grade 3 to 8
- test scores are **centered around 0**
 - negative values indicate that a grade in a school district in a specific year performed worse than the average
- available for the school years **2008/09 to 2017/18**
- contains control variables that are merged from the **American Community Survey (ACS)**

Empirical Strategy & Identification

Event Study Design

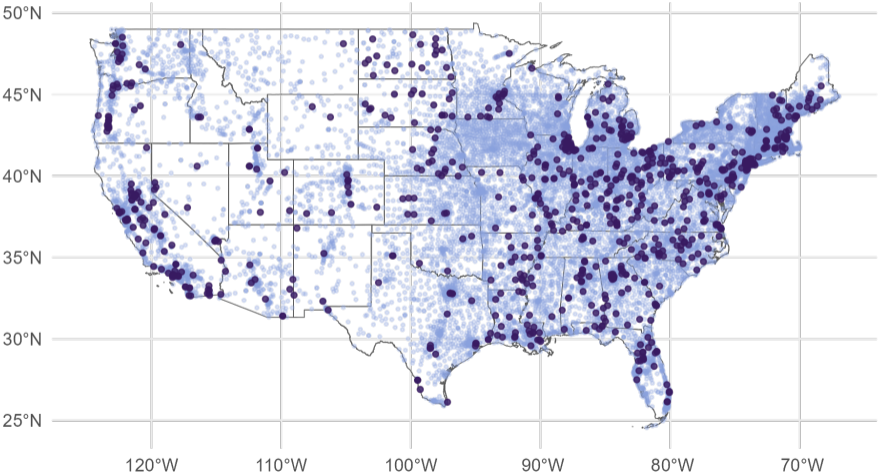
To estimate the effect of library closures on math and reading test scores, we estimate an event study model using Sun and Abraham (2021) to account for staggered treatment:

$$y_{dgst} = \sum_{j \in -5 \dots 0 \dots 6} \gamma_j \times (Closure)_{d,t-j} + \alpha_{dg} + \delta_{zt} + \epsilon_{dgst}, \text{ where} \quad (1)$$

- y is the **cohort-standardized test score** in school district d , for grade g and subject s in the year t
- $(Closure)_{d,t-j}$ indicates the distance from the year in which a **library unit was closed** within the school district d
- I include school district-grade fixed-effects α_{dg} and state-year fixed-effects δ_{zt} , standard errors are clustered at the school district-level

Library Closures in the U.S. as Treatment Shocks

Figure: Public Libraries in the United States and their Closures between 2009 and 2018

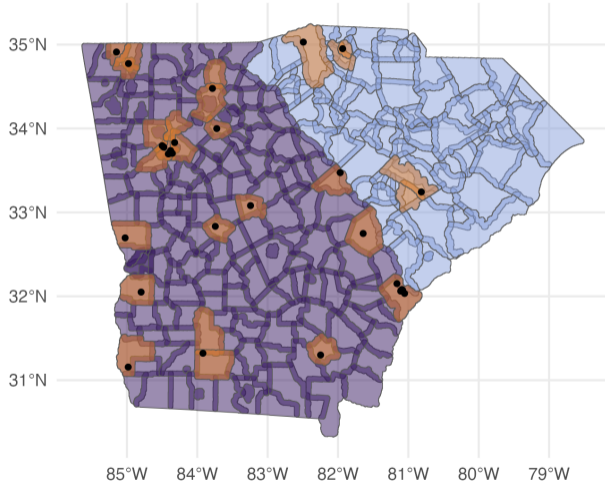


Identification Strategy

We use **library closures** as treatment shocks.

- Exploiting information on timing and geo-location of closure
- No clusters over space or trends in time [▶ Figure](#)
- Vary radius for treatment definition (1, 2, 5 and 10 miles)
- We exclude closures if a library branch was opened in the same library system within 2 years (assuming this closure is a relocation)
- Openings and closures are only weakly correlated ($\rho = -0.004$)

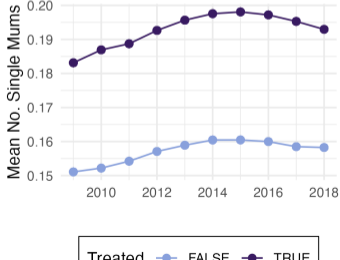
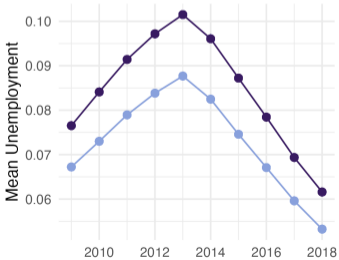
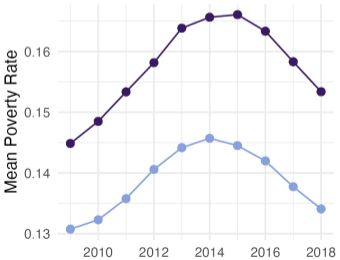
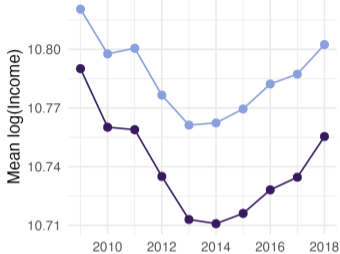
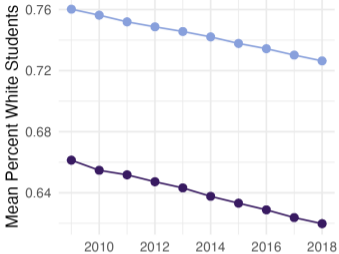
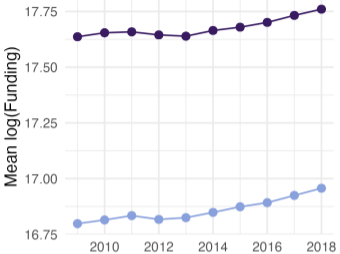
Definition of Treatment



- School districts are treated if a library closed **within a 2-mile radius** of that school district
- But only within state borders, as it is costly to visit an out-of-state library

▶ Summary Statistics

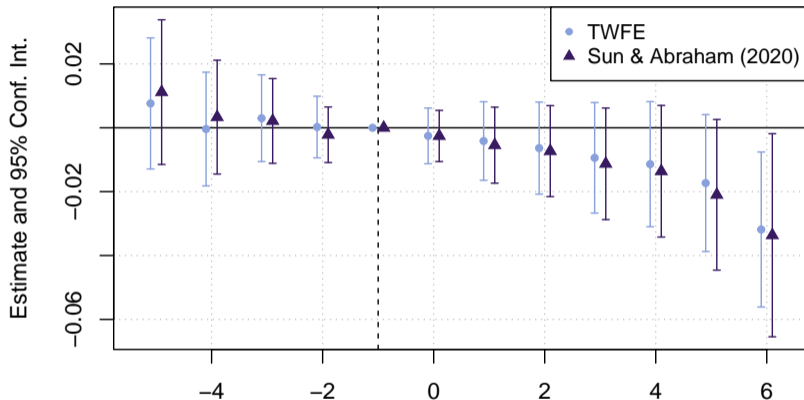
Summary Statistics between 2009 and 2018



Treated — FALSE — TRUE

Overall Results

Effect of Library Closures on the Cohort-Standardized Test Scores



- Negative effects of library closures on test scores for the following years

ATT calculated using the Sun and Abraham (2021) estimator

Model:	(1)	(2)	(3)	(4)	(5)
Library Closure (ATT)	-0.0135*	-0.0132*	-0.0131*	-0.0132*	-0.0117*
	(0.0070)	(0.0071)	(0.0071)	(0.0071)	(0.0071)
log(Pub. School Fund.)		0.0343***	0.0341***	0.0341***	0.0285***
		(0.0105)	(0.0104)	(0.0104)	(0.0105)
School District-Grade	Yes	Yes	Yes	Yes	Yes
State-Year	Yes	Yes	Yes	Yes	Yes
Subject-Year			Yes	Yes	
Grade-Year				Yes	
Controls					Yes
Dep. var. mean	0.01519	0.01563	0.01563	0.01563	0.01585
Observations	559,645	557,942	557,942	557,942	556,799
R ²	0.730	0.730	0.731	0.731	0.731

- Library closures reduce test scores by 0.013 s.d. within a 2-mile radius
- Controls: Unemp. Rate, Poverty Rate (in %), Log(Median HH Income), Share Single Moms, SNAP Rec. (in %)

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Robustness

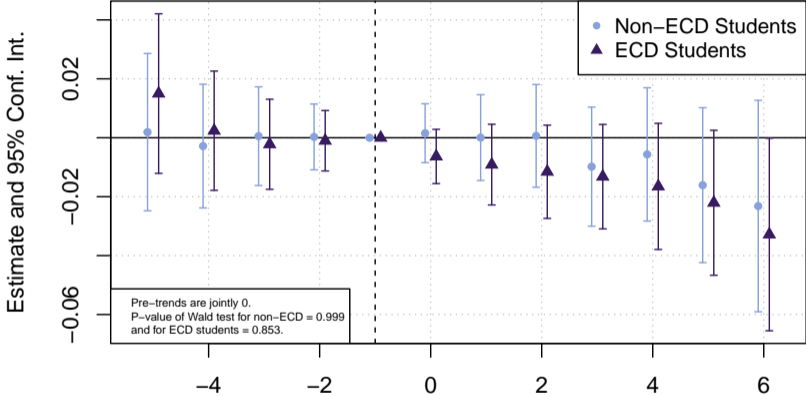
Changing the Radius for Treatment

Dependent Variable	Test Scores				
	Radius: None	1 mile	2 miles	5 miles	10 miles
Library Closure (ATT)	-0.0214** (0.0097)	-0.0148* (0.0083)	-0.0132* (0.0071)	-0.0075 (0.0055)	-0.0001 (0.0043)
log(Pub. School Fund.)	0.0336*** (0.0104)	0.0340*** (0.0104)	0.0343*** (0.0105)	0.0353*** (0.0105)	0.0340*** (0.0106)
School District-Grade	Yes	Yes	Yes	Yes	Yes
State-Year	Yes	Yes	Yes	Yes	Yes
Dep. var. mean	0.01551	0.01560	0.01563	0.01579	0.01553
Observations	557,942	557,942	557,942	557,942	557,942
R ²	0.730	0.730	0.730	0.730	0.730

- As expected, the effect diminishes as the radius for treatment definition grows

Heterogeneity

Analysis by Economic Background



- The effects is driven by economically disadvantages students

Analysis by Economic Background – ATT

Dependent Variables: Model:	Test Scores	
	Non-ECD Students	ECD Students
<i>Variables</i>		
Library Closure (ATT)	-0.0071 (0.0081)	-0.0156** (0.0075)
School District-Grade	Yes	Yes
State-Year	Yes	Yes
Dep. var. mean	0.29367	-0.24799
Observations	464,864	477,374
R ²	0.609	0.567

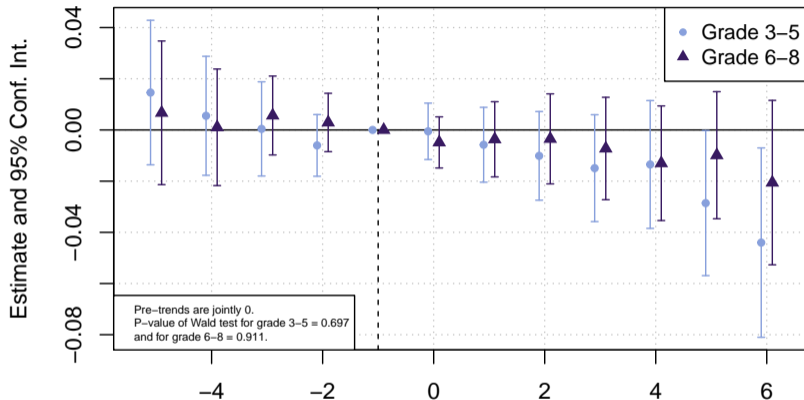
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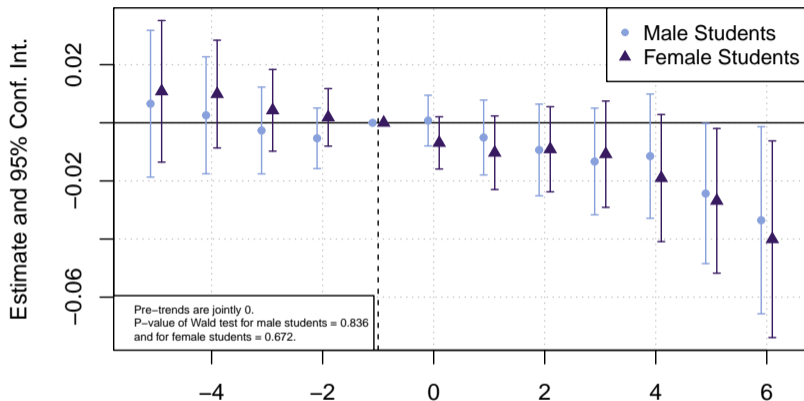
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Differences in Effects by Age



- Children who are in elementary school when a library closes experience stronger and longer lasting effects

Gender Differences in the Effect of a Library Closure



- Girls experience stronger negative effects, but gender differences are not very stark

► Racial Differences

Performance Gaps *within* School Districts

Dependent Variable: Model:	Performance Gaps		
	Black-white Gap (1)	ECD Gap (2)	Gender Gap (3)
<i>Variables</i>			
Library Closure (ATT)	0.0137* (0.0082)	0.0063 (0.0060)	0.0022 (0.0044)
<i>Fixed-effects</i>			
School district-Grade	Yes	Yes	Yes
State-Year	Yes	Yes	Yes
Dep. var. mean	0.61414	0.51667	-0.12372
Observations	136,052	408,529	479,458
R ²	0.605.	0.449	0.184

- Within school districts, only the gap between Black and white children increases

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- We consider four potential channels:
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 2. quiet study space
 3. access to the internet and computers
 4. access to library programming and librarians

Potential Mechanisms

Through which channels do library closures affect children's test scores?

- We consider four potential channels:
 1. books and additional study materials
 2. quiet study space
 3. access to the internet and computers
 4. access to library programming and librarians
- these dimensions are of **greater importance to some (often poorer) communities**

(1) Books and Additional Study Materials

Dependent Variable: Model:	Test Scores	
	Bookmobile	Physical Library Outlet
Library Closure (ATT)	-0.0072 (0.0090)	-0.0154** (0.0072)
<i>Fixed-effects</i>		
School district-Grade	Yes	Yes
State-Year	Yes	Yes
<i>Fit statistics</i>		
Dep. var. mean	0.01873	0.01578
Observations	542,165	556,870
R ²	0.727	0.730

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- The ATT is only significant for physical library outlets ⇒ **excludes book channel**

(2 & 3) Quiet Study Space/Internet – What People Do at Libraries

Table: Top Ten Activities in Libraries by Income and Intensity (Time spent in Hours)

High Income		Low Income	
Activity in a Library	Intensity	Activity in a Library	Intensity
Reading for personal interest	245.56	Rsrch/HW for class	227.21
Rsrch/HW for class	218.33	Reading for personal interest	111.75
Insufficient detail in verbatim	129.31	Computer use for leisure	82.33
Work, main job	70.04	Job search activities	73.50
Computer use for leisure	51.48	Insufficient detail in verbatim	59.85
Job search activities	28.93	Work, main job	21.85
Attending meetings	21.88	Socializing and communicating	13.30
Television and movies	17.08	Volunteer activities	12.99
Teaching, leading, counseling	15.36	Attending meetings	9.20
Looking after children	13.12	Personal e-mail and messages	7.95

Source: own calculations, data: American Time Use Survey (ATUS).

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Summary of Results

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We find that...

- ...a **library closure reduces test scores** by around 0.013 standard deviations.
- ...this effect is mostly driven by **economically disadvantaged students** and elementary school children.
- ...mechanism analysis suggests that losing **quiet study space and internet access** might be key drivers behind this effect.

Thanks for your attention!

I'm happy to answer any questions and look forward to your feedback.

-  Bhatt, Rachana (2010). “The impact of public library use on reading, television, and academic outcomes”. In: *Journal of Urban Economics* 68.2, pp. 148–166.
-  Ferreira Neto, Amir Borges (2023). “Do public libraries impact local labour markets? Evidence from Appalachia”. In: *Spatial Economic Analysis* 18.2, pp. 216–238.
-  Gilpin, Gregory, Ezra Karger, and Peter Nencka (2023). “The Returns to Public Library Investment”. In: *American Economic Journal: Economic Polivy*.
-  Kevane, Michael and William A Sundstrom (2014). “The development of public libraries in the United States, 1870–1930: A quantitative assessment”. In: *Information & Culture* 49.2, pp. 117–144.
-  Klinenberg, Eric (2019). *Palaces for the people: how social infrastructure can help fight inequality, polarization, and the decline of civic life*. New York: Broadway Books.
-  Porter, Andrew Joseph (2015). “Essays in Crime and Behavior”. PhD thesis. UC Irvine.
-  Sun, Liyang and Sarah Abraham (2021). “Estimating dynamic treatment effects in event studies with heterogeneous treatment effects”. In: *Journal of Econometrics* 225.2, pp. 175–199.

	Not Treated	Treated	Difference
SEDA Test Scores			
Mean Math Score	0.04	-0.02	-0.06
Mean Reading Score	0.03	0.00	-0.03
Public Libraries, School Districts and Funding			
Number of Libraries	1.65	3.79	2.14
Number of Students	261	949	688
Log Mean School Funding per Student	11.92	11.96	0.04
School District Characteristics			
Share Black Students (in %)	7.24	14.77	7.52
Share Hispanic Students (in %)	12.05	14.74	2.69
Share ECD Students (in %)	46.56	48.57	2.02
Mean Poverty Rate (in %)	12.20	12.65	0.45
Mean Unemp Rate (in %)	6.61	7.25	0.63
Mean Income (Log)	10.88	10.92	0.04

Source: own calculations, data: Educational Opportunity Project at Stanford University (SEDA) and Public Library Survey (PLS).

ATT for the Unbalanced Panel [◀ Back](#)

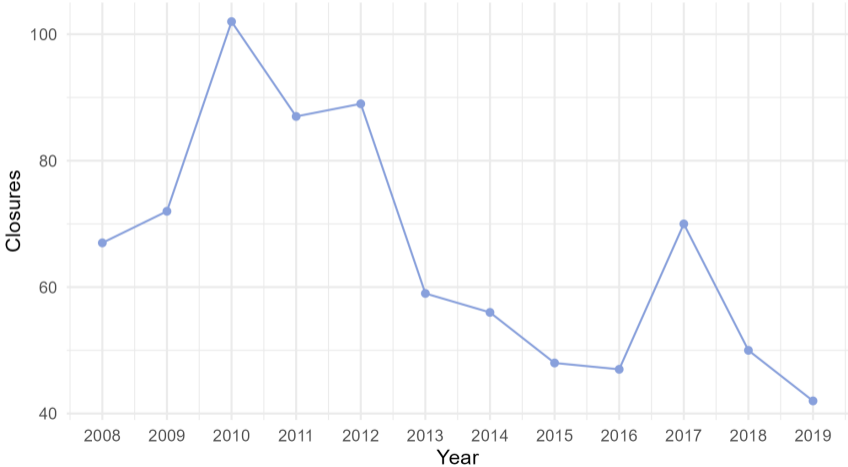
Dependent Variable:	Test Scores			
	Balanced Panel		Unbalanced Panel	
Model:	Base (1)	Add Funding (2)	Base (3)	Add Funding (4)
Library Closure (ATT)	-0.0135* (0.0070)	-0.0132* (0.0071)	-0.0051 (0.0047)	-0.0056 (0.0047)
log(Funding)		0.0343*** (0.0105)		0.0251*** (0.0064)
<i>Fixed-effects</i>				
School district-Grade	Yes	Yes	Yes	Yes
State-year	Yes	Yes	Yes	Yes
<i>Fit statistics</i>				
Dep. var. mean	0.01519	0.01563	0.03231	0.03296
Observations	559,645	557,942	1,111,512	1,106,285
R ²	0.730.	0.730	0.765.	0.765

Clustered (School district) standard-errors in parentheses

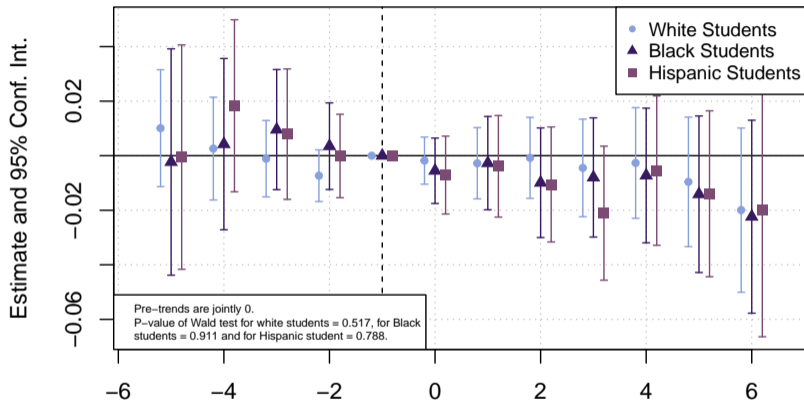
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Public Libraries that Closed between 2008 and 2019 by Year of Closure

[← Back](#)



Effect of a Library Closure by Race [← Back](#)



- Black and Hispanic students seem to be affected more and earlier