In-person session 9

March 12, 2026

PMAP 8521: Program evaluation
Andrew Young School of Policy Studies

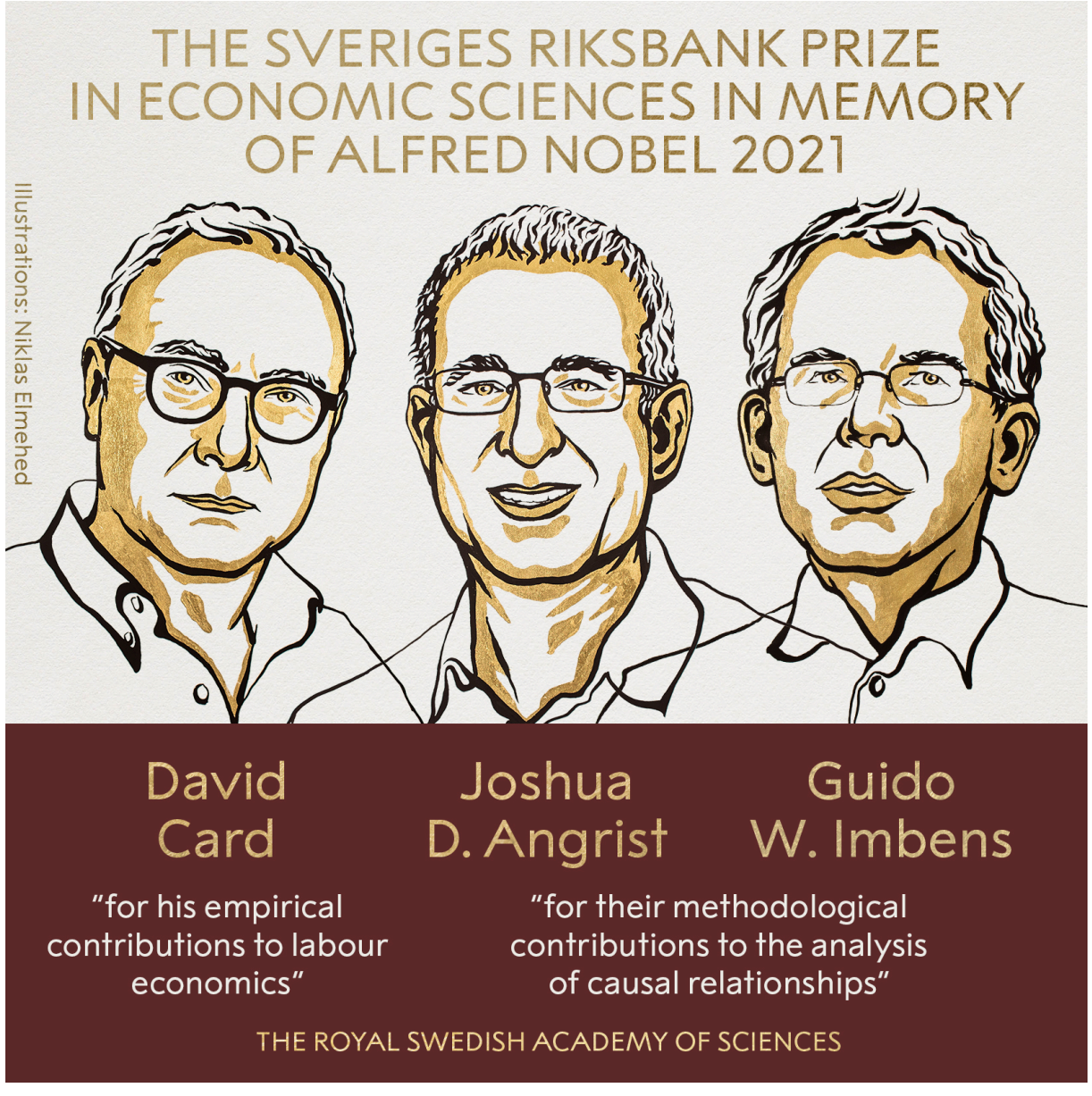
Plan for today

Adjustment vs. circumstances

Interaactions and regression

Diff-in-diff stuff

Adjustment vs. circumstances

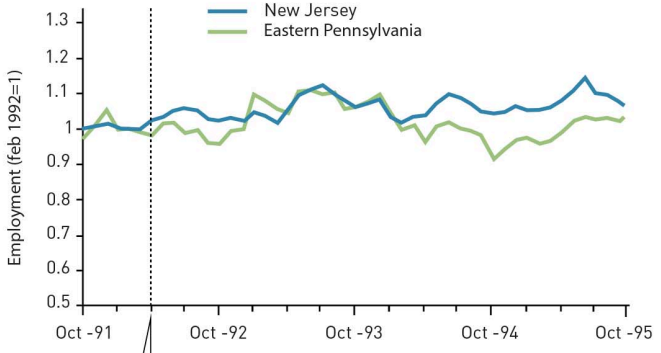

THE SVERIGES RIKSBANK PRIZE
IN ECONOMIC SCIENCES IN MEMORY
OF ALFRED NOBEL 2021
Illustrations: Niklas Elmehed
David Card
"for his empirical contributions to labour economics"
Joshua D. Angrist
Guido W. Imbens
"for their methodological contributions to the analysis of causal relationships"
THE ROYAL SWEDISH ACADEMY OF SCIENCES


How the Estimated $200 Billion Reduction in Consumer Spending
in 2013 Would Likely Be Spread Out
THE WHITE HOUSE
WASHINGTON

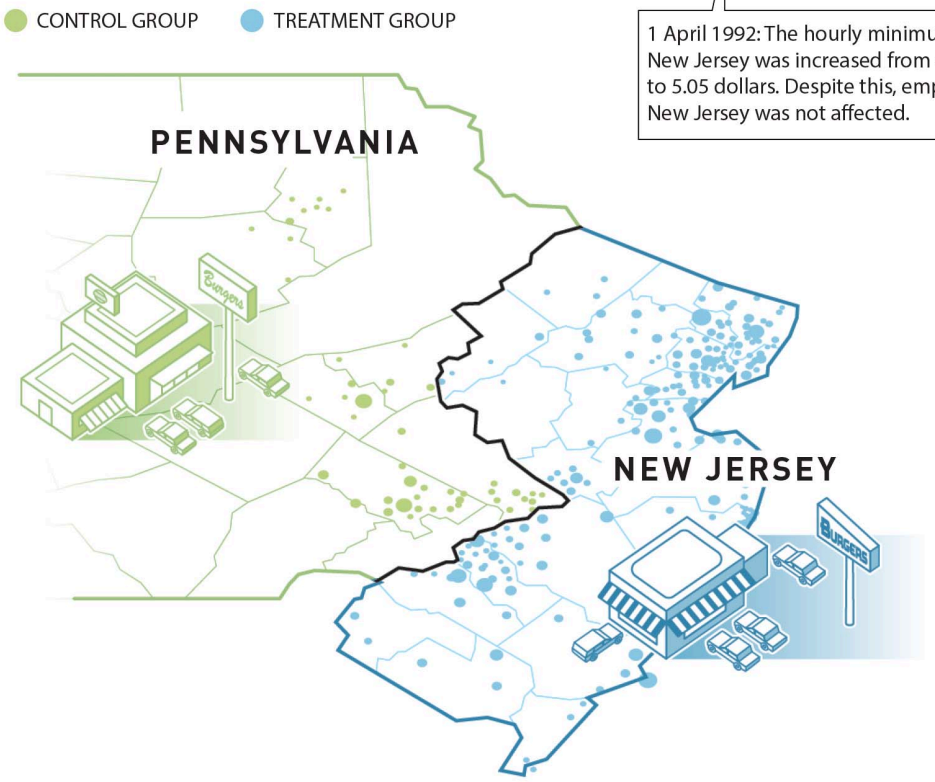
The effect of increasing the minimum wage

Card and Krueger used a natural experiment to study how increasing the minimum wage affects employment.

The researchers identified a treatment group (restaurants in New Jersey) and a control group (restaurants in eastern Pennsylvania) to measure the effect of increasing the minimum wage.



1 April 1992: The hourly minimum wage in New Jersey was increased from 4.25 dollars to 5.05 dollars. Despite this, employment in New Jersey was not affected.



Circumstantial vs. adjustment-based identification

Special situations vs. controlling for stuff

How would you know when it is appropriate to use a quasi-experiment over an RCT?

Identification strategies

The goal of *all* these methods is to isolate
(or **identify**) the arrow between treatment → outcome

Adjustment-based identification

DAGs | Matching | Inverse probability weighting

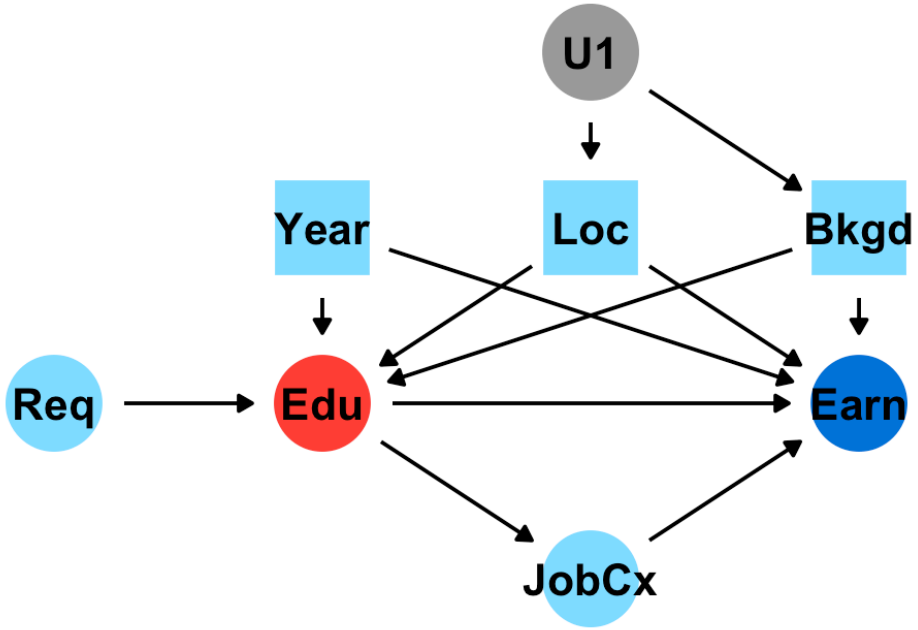
Circumstantial identification

Randomized controlled trials | Difference-in-differences

Regression discontinuity | Instrumental variables

Adjustment-based identification

Use a DAG and *do*-calculus to isolate arrow



Core assumption: selection on observables

Everything that needs to be adjusted is measurable; no unobserved confounding

Big assumption!

This is why lots of people don't like DAG-based adjustment

~~Prince~~ Charles
King

- Male
- Born in 1948
- Raised in the UK
- Married twice
- Lives in a castle
- Wealthy & famous

Ozzy Osbourne

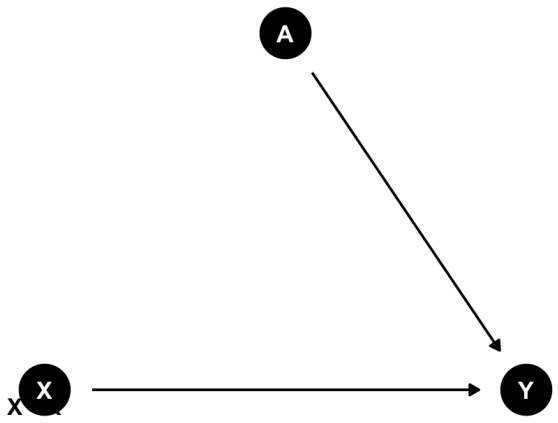
- Male
- Born in 1948
- Raised in the UK
- Married twice
- Lives in a castle
- Wealthy & famous

Circumstantial identification

Use a special situation to isolate arrow

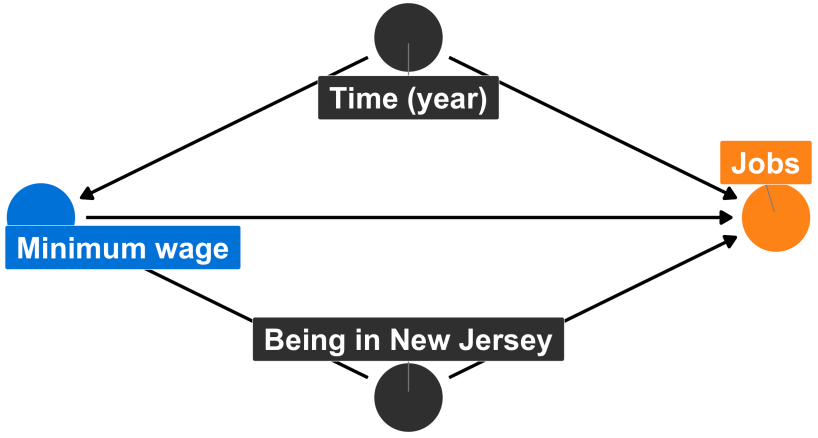
RCTs

Use randomization to remove confounding



Difference-in-differences

Use before/after & treatment/control differences to remove confounding



Which is better or more credible? RCTs, quasi experiments, or DAG-based models?

THE CAUSALITY CONTINUUM

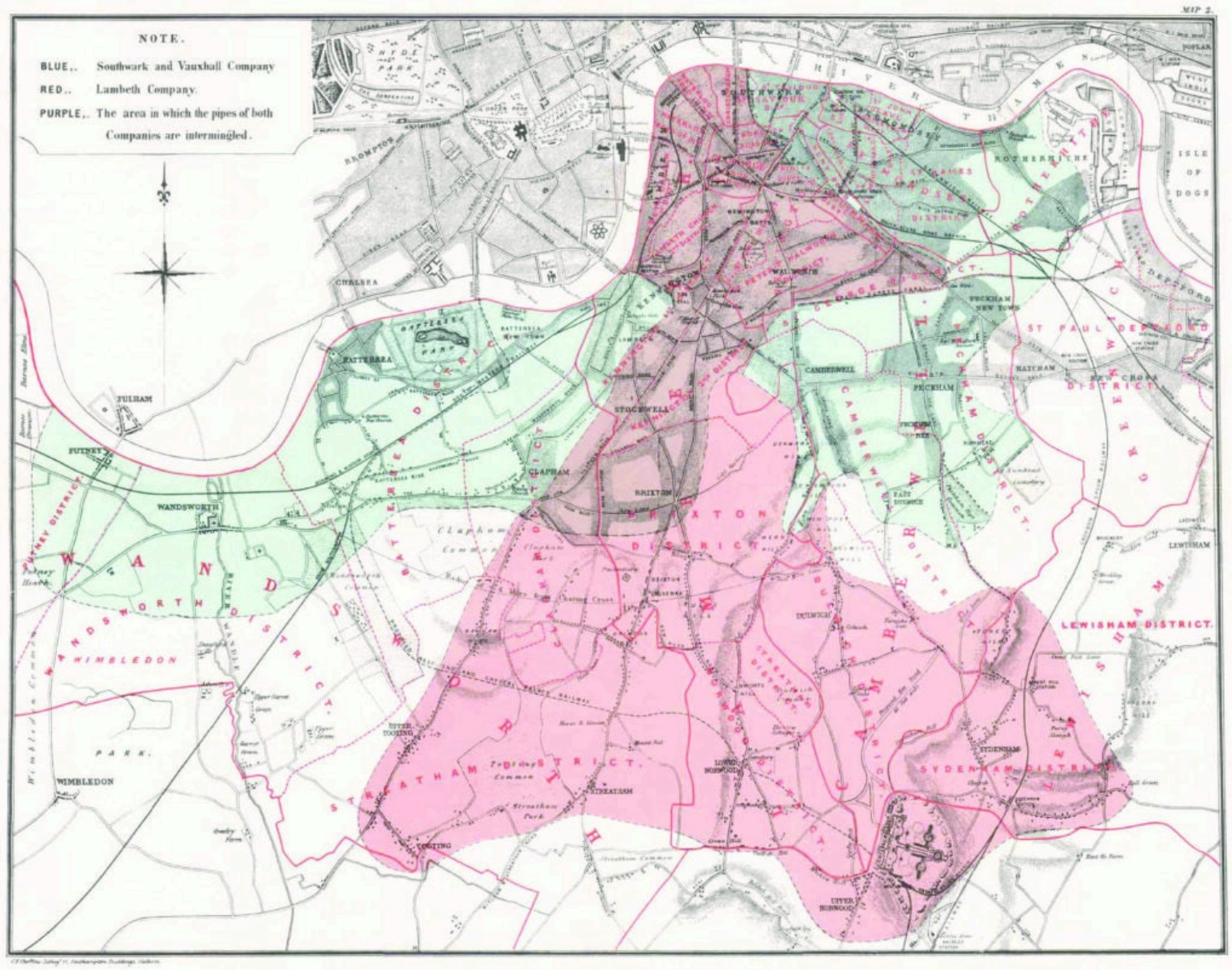
There's no hierarchy!

Interactions and regression

Can we talk more about interaction terms and how to interpret them?

Regression is just fancy averages!

Diff-in-diff stuff


NOTE.
BLUE,.. Southwark and Vauxhall Company
RED,.. Lambeth Company.
PURPLE,.. The area in which the pipes of both Companies are intermingled.
MAP 2.
RIVER THAMES
CHELSEA
BATTERSEA
PUTNEY
FULHAM
WANDSWORTH
CLAPHAM
BRIXTON
STOCKWELL
CAMBERWELL
PECKHAM
ROTHERHITHE
ISLE OF DOGS
DEPTFORD
LEWISHAM
SYDENHAM
STREATHAM
TOOTING
WIMBLEDON
PARK.
WANDSWORTH DISTRICT.
PUTNEY DISTRICT
BRIXTON DISTRICT.
CAMBERWELL DISTRICT.
LEWISHAM DISTRICT.
SYDENHAM DISTRICT.
STREATHAM DISTRICT.
WIMBLEDON DISTRICT.

1849

Cholera deaths per 100,000

Southwark & Vauxhall: 1,349

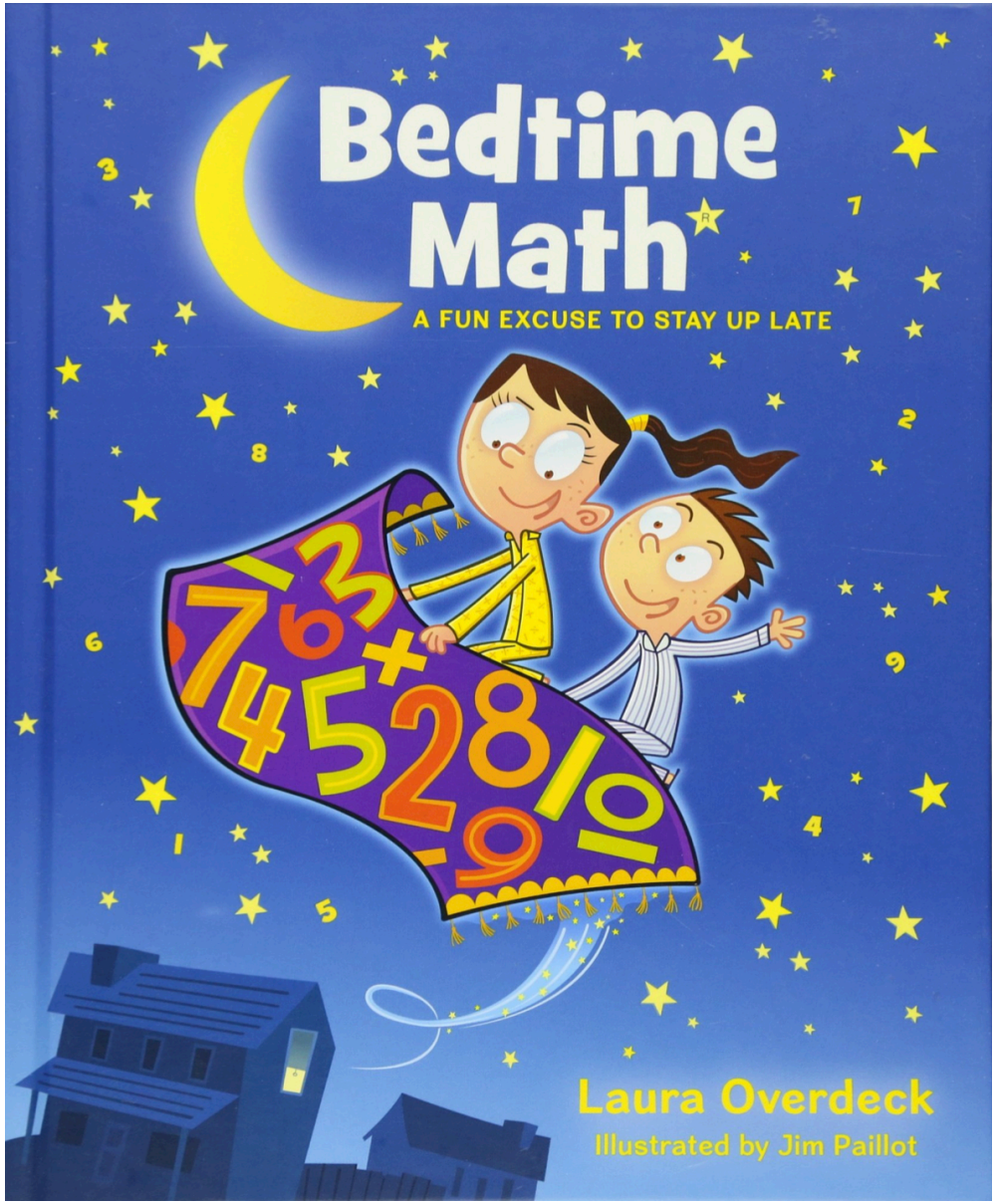
Lambeth: 847

1854

Cholera deaths per 100,000

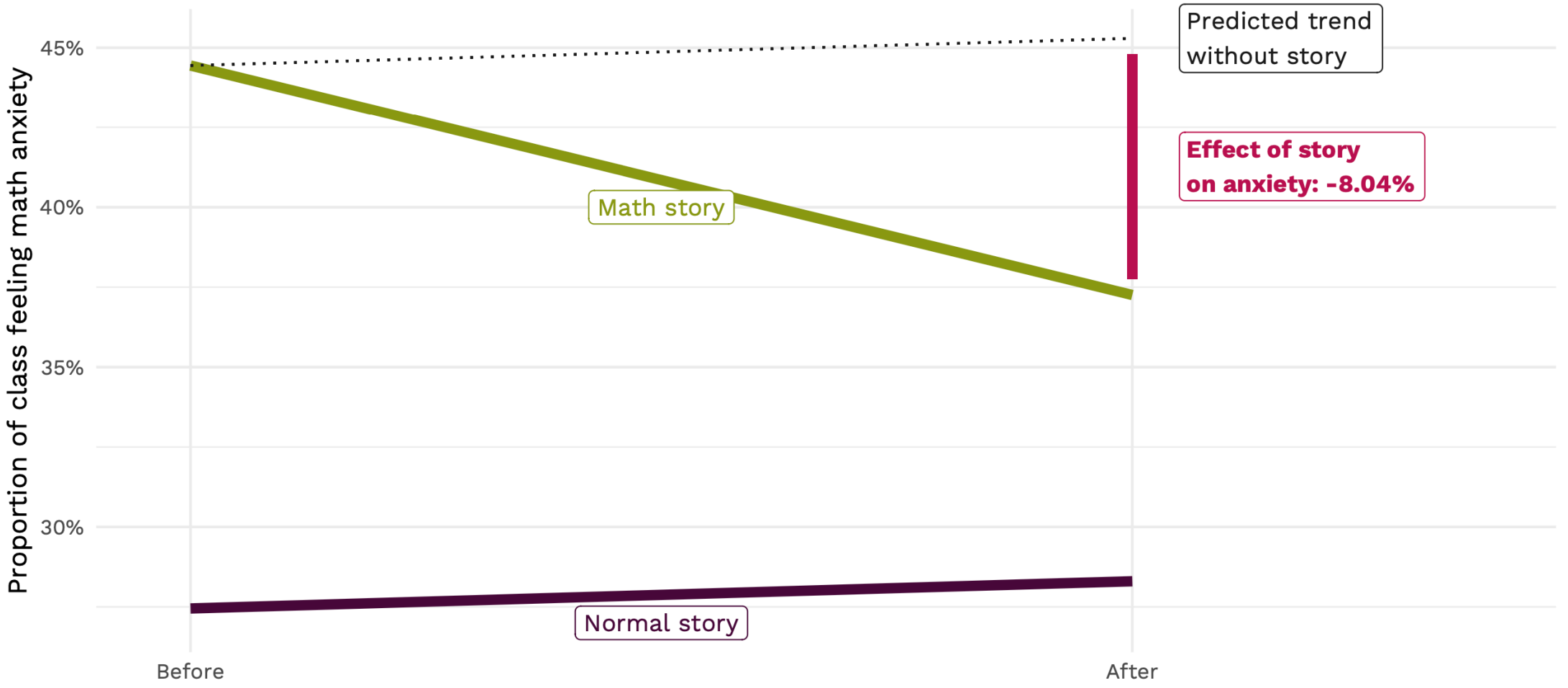
Southwark & Vauxhall: 1,466

Lambeth: 193


Bedtime Math
A FUN EXCUSE TO STAY UP LATE
Laura Overdeck
Illustrated by Jim Paillot

Reading a story about math reduces math anxiety

Experiment in four 4th grade classes



When doing your subtracting to get your differences in the matrix, is it better to do the vertical or horizontal subtractions?

Are there situations where one is preferable to the other?

Why are we learning two ways to do diff-in-diff? (2x2 matrix vs. `lm()`)

What happened to confounding??

Now we're only looking at just two "confounders"?

Should we still control for things?

DIDID(IDIDID)?

The effect of mandatory maternity benefits on wages

New Jersey implements policy; Pennsylvania doesn't

Only applies to married women who have kids

Married women 20–40 - single men/unmarried women/older women in NJ and PA

TABLE 3—DDD ESTIMATES OF THE IMPACT OF STATE MANDATES ON HOURLY WAGES

Location/year	Before law change	After law change	Time difference for location
A. *Treatment Individuals: Married Women, 20–40 Years Old:*			
Experimental states	1.547 (0.012) [1,400]	1.513 (0.012) [1,496]	−0.034 (0.017)
Nonexperimental states	1.369 (0.010) [1,480]	1.397 (0.010) [1,640]	0.028 (0.014)
Location difference at a point in time:	0.178 (0.016)	0.116 (0.015)	
Difference-in-difference:	−0.062 (0.022)		
B. *Control Group: Over 40 and Single Males 20–40:*			
Experimental states	1.759 (0.007) [5,624]	1.748 (0.007) [5,407]	−0.011 (0.010)
Nonexperimental states	1.630 (0.007) [4,959]	1.627 (0.007) [4,928]	−0.003 (0.010)
Location difference at a point in time:	0.129 (0.010)	0.121 (0.010)	
Difference-in-difference:	−0.008: (0.014)		
DDD:	**−0.054** **(0.026)**		

Can you walk through an example of diff-in-diff in class?

Two-way fixed effects (TWFE)

Two states: Alabama vs. Arkansas

$$\begin{aligned}\text{Mortality} = \beta_0 + \beta_1\, \text{Alabama} + \beta_2\, \text{After 1975} + \\ \beta_3\, (\text{Alabama} \times \text{After 1975})\end{aligned}$$

All states: `Treatment == 1`
if legal for 18-20-year-olds to drink

$$\text{Mortality} = \beta_0 + \beta_1 \text{ Treatment} + \beta_2 \text{ State} + \beta_3 \text{ Year}$$

$$\text{Mortality} = \beta_0 + \beta_1 \text{ Alabama} + \beta_2 \text{ After 1975} + \beta_3 \left(\text{Alabama} \times \text{After 1975}\right)$$

vs.

$$\text{Mortality} = \beta_0 + \beta_1 \text{ Treatment} + \beta_2 \text{ State} + \beta_3 \text{ Year}$$

$$\text{Donation rate} = \beta_0 + \beta_1 \text{ California} + \beta_2 \text{ After Q22011} + \beta_3 \text{ (California} \times \text{After Q22011)}$$

vs.

$$\text{Donation rate} = \beta_0 + \beta_1 \text{ Treatment} + \beta_2 \text{ State} + \beta_3 \text{ Quarter}$$

What about this staggered treatment stuff?

See this