The Social Transmission of Non-Infectious Diseases: Evidence from the Opioid Epidemic

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Motivation (1/2)

Background

- Prescription opioid abuse has triggered severe public health crisis in the U.S.
- Last 20 years: 800,000 drug overdose deaths in the U.S.
- Covid-19 pandemic has reinforced opioid epidemic

Economic Consequences

- Decrease in ***labor force participation*** (Krueger, 2017), deterioration of ***municipal finances*** (Cornaggia et al., 2021) , and ***negative firm valuation effects*** (Ho and Jiang, 2019; Ouimet et al., 2021)

What drives the opioid epidemic?

- Spatial spread of opioid epidemic not well-understood

Motivation (2/2)

Research Question

Are social connections a driver of the opioid epidemic?

Why Social Connections? Friendship networks ...

- ... affect economic outcomes like ***international trade*** (Bailey et al., 2021a), ***housing markets*** (Bailey et al., 2018a), ***Earned Income Tax Credit claiming behavior*** (Wilson, 2020), ***access to capital*** (Bailey et al., 2018a; Rehbein and Rother, 2020), ***insurance decisions*** (Hu, 2020), or ***product adoption*** (Bailey et al., 2021b)
- ... are important for predicting ***the spread of infectious diseases*** (Bailey et al., 2020; Kuchler et al., 2021)

$\rightsquigarrow$ Idea of this paper: analyze the effect of social networks on the spread of *non-infectious* diseases

Data

Social Connections

- County-to-county Social Connectedness Index (Bailey et al., 2018b)

$$SCI_{ij} = \frac{Friendships_{ij}}{FBUsers_i \times FBUsers_j}$$

  $\rightsquigarrow$ SCI allows a unique representation of U.S. friendship networks

Mortality

- Overdose deaths from the Centers for Disease Control and Prevention (CDC)

Further Covariates

- Demographics, economic conditions, opioid prescriptions (CDC and ARCOS DEA)

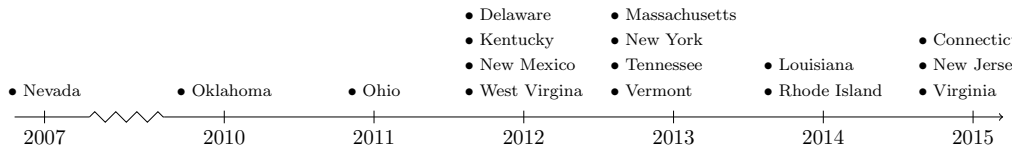
Empirical Design

Identification

- Challenges: **self-selection** and **correlated exposure to shocks**
- Solution: random shocks to parts of existing network

Setting

Figure 1: Must-access PDMP introductions between 2007 and 2015



- **Approach:** (i) identify direct effect of PDMPs and (ii) study how shocks propagate through friendship networks to counties in non-implementing states

PDMP Introductions - Direct Effect

$$y_{it} = \theta \times PDMP_{it} + \mathbf{X}_{it} \times \boldsymbol{\delta} + \phi_i + \gamma_t + \varepsilon_{it}$$

	Legal Opioid Prescriptions	Total Opioids (T40.1-T40.4)	Prescription Opioids (T40.2+T40.3)	Heroin (T40.1)	Heroin+Fentanyl (T40.1+T40.4)
	(1)	(2)	(3)	(4)	(5)
PDMP	-0.038**	5.336***	0.163	2.372***	5.172***
	(0.015)	(1.228)	(0.179)	(0.421)	(1.216)
Dependent Mean	0.74	7.80	4.12	2.18	4.40
Year FE	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes
N	35,913	52,876	52,876	52,876	52,876
R^2	0.944	0.641	0.638	0.595	0.644

PDMP Introductions - Network Effect (1/3)

Measurement and Interpretation

$$PDMP\ NetExposure_{it} = \sum_{j \neq s}^{S} \underbrace{\mathbb{1}(\text{PDMP in state j})_t}_{=1 \text{ if state } j \text{ has PDMP at } t} \times \underbrace{\frac{SCI_{ij}}{\sum_g^S SCI_{ig}}}_{\text{importance of state } j}$$

$$y_{it} = \alpha \times PDMP\ NetExposure_{it} + \mathbf{X}_{it} \times \boldsymbol{\delta} + \phi_i + \gamma_{st} + \varepsilon_{it}$$

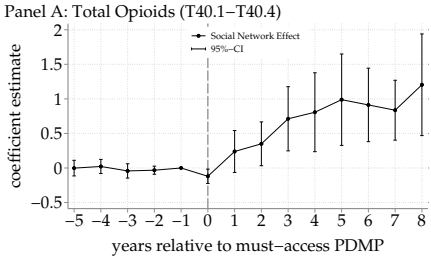
Interpretation: α measures how shocks to illegal drug consumption in PDMP implementing states travel through friendship networks

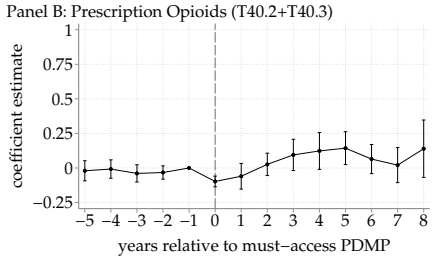
Identifying Assumption: high and low out-of-state PDMP exposure counties would have trended similarly had the out-of-state PDMP introductions not taken place

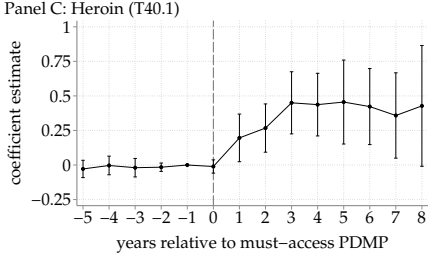
PDMP Introductions - Network Effect (2/3)

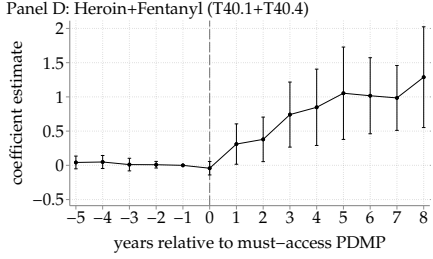
	Total Opioids (T40.1-T40.4)	Prescription Opioids (T40.2+T40.3)	Heroin (T40.1)	Heroin+Fentanyl (T40.1+T40.4)
	(1)	(2)	(3)	(4)
PDMP NetExposure	1.525***	0.188*	0.857***	1.592***
	(0.391)	(0.112)	(0.213)	(0.388)
Dependent Mean	8.65	4.44	2.47	5.04
State × Year FE	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
N	44,065	44,065	44,065	44,065
R^2	0.767	0.681	0.765	0.788

PDMP Introductions - Network Effect (3/3)

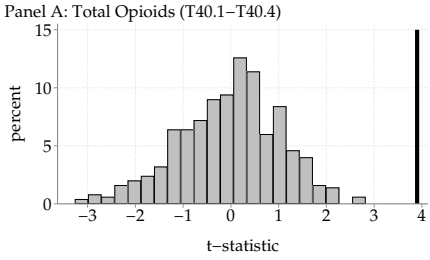


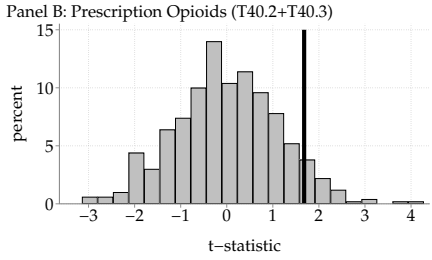


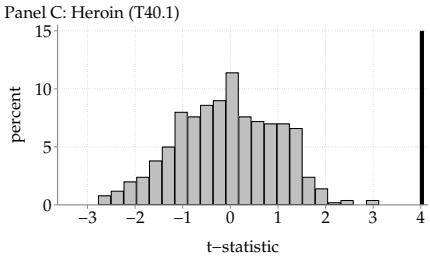


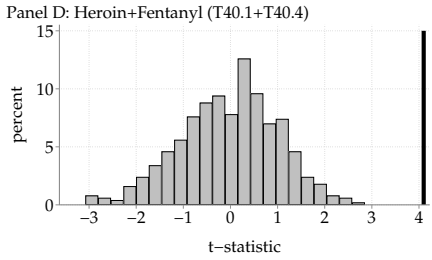


PDMP Introductions - Placebo Test









Summary

Must-access PDMPs

- Substantial substitution to illegal drugs after introduction of must-access PDMPs
- Out-of-state counties not directly affected by PDMP implementation also experience substantial substitution to illegal drugs due to friendship network exposure

Further Results in the Paper

- Characterize spatial spread of opioid epidemic over time
- Consistent results using OxyContin reformulation as another shock to illegal drug consumption

$\rightsquigarrow$ Social connections drive opioid epidemic

The End

Thank You!

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