Does mandatory labeling of outfall points influence pollution and compliance? Evidence from a natural experiment in Ohio

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The evolution of an evaluation

- In 2014, EPA OECA colleagues:
  - Introduced me to Ohio's programs
  - Wondered if I had thoughts on likely impacts
  - Wondered if I had thoughts on how innovative programs like this might be evaluated
  - Noted Ohio's data availability and data quality

Research Question

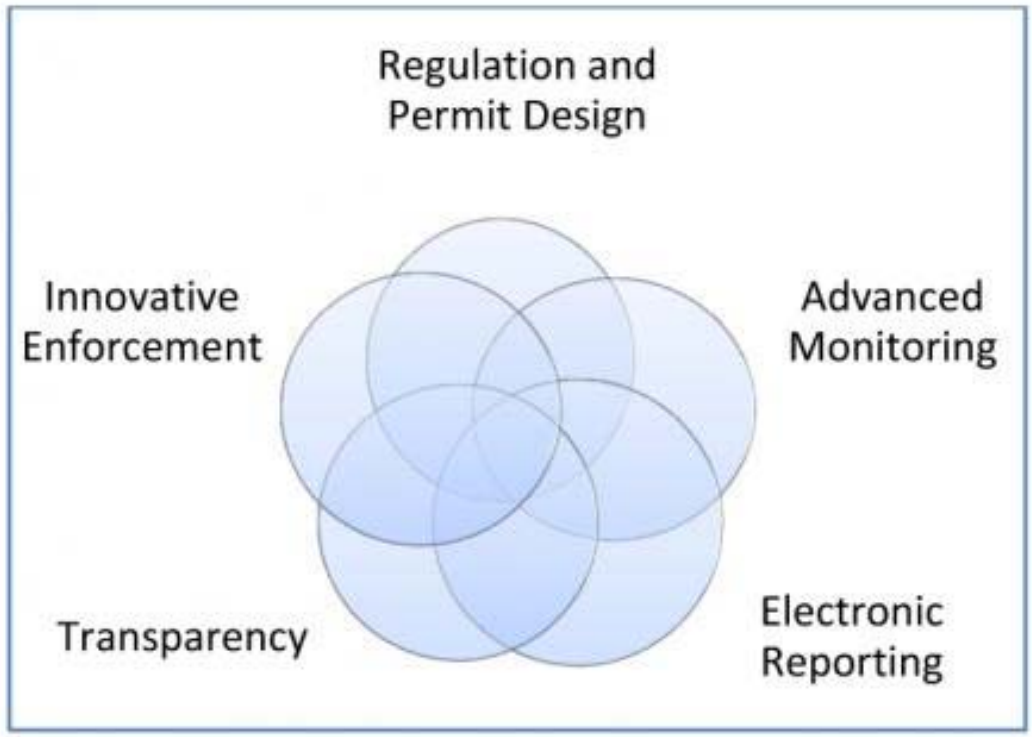
- A student, a post-doctoral associate, and I set out to reflect on this question….

  Do requirements that water polluters post signs containing permit information and contact information at all discharge points influence compliance and emissions?

From my perspective, this is a pretty interesting question…

- *Practice*: Water quality remains a meaningful environmental issue in the US.
- *Scholarship*: Standard theory presumes that disclosure without novel information or specific performance data should have no effect, yet …
- *Policy*: This discharge labeling program typifies a key pillar of the growing "next generation enforcement compliance" movement….

EPA's Next Generation Compliance Initiative



Source: EPA OECA

Step 1: What does the literature tell us?

- A large and growing theory literature spanning many disciplines suggests disclosure can impact performance.
    - (Sunstein 1999; Weil et al. 2006; Loewenstein et al. 2014)

→Theory suggests signage *could* influence pollution and compliance.

Mechanism 1: Signage may affect entities' perceptions of direct benefits and costs of pollution and noncompliance

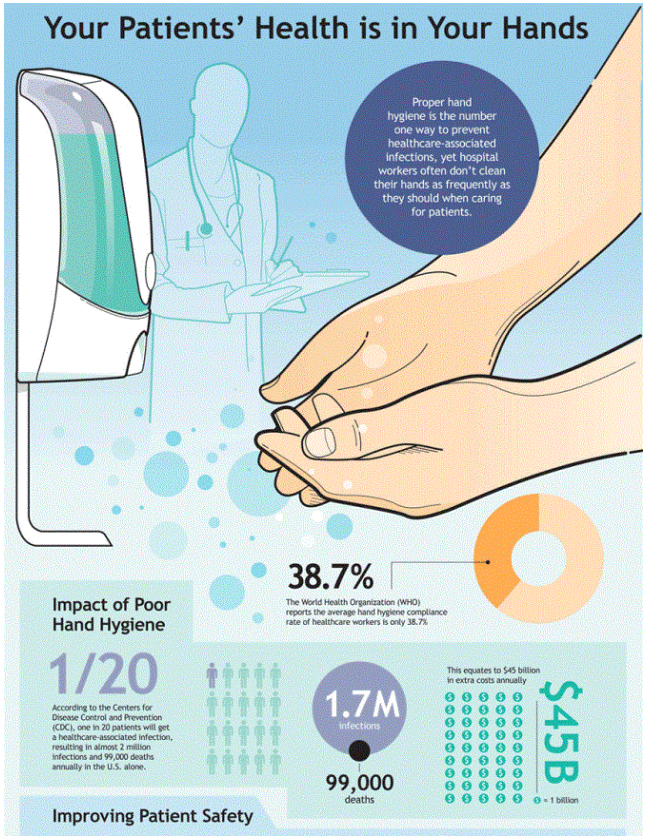
R I V E R
K E E P E R S

A large and growing literature suggests environmental compliance and pollution are strongly influenced by:

- Activist, community, and NGO pressure (Eesley and Lenox 2006; Innes and Sam 2008; Konisky and Reenock 2013)
- Citizen complaints, citizen monitoring, citizen suits (Langpap and Shimshack 2010; Grant and Grooms 2012)
- Employee loyalty, consumer WTP, access to capital (Fombrun 1996; Diermeier 2011; Kitzmueller and Shimshack 2012)

- A related mechanism is that plants perceive signage as a signal that the regulator has renewed interest in water pollution oversight.

Mechanism 2: Signage may leverage economic psychology channels such as *reminder and reassurance functions*



Signage may remind and reassure the regulated community that:

- prosocial behaviors have consequences
- noncompliance may be detected
- the organization is obliged to commit to prosocial principles.

(Thornton et al. 2005; Hindin & Silberman 2016; Pittet et al. 2000; Lowry & Joslyn 2014)

Mechanism 2: Signage may leverage economic psychology channels such as *objective self-awareness*.

- Subtle cues of being watched significantly increase prosocial behaviors in laboratory & in real-world settings.

- Disclosure of antisocial behaviors may threaten the decision-makers' self-conceptions as an honest individual or part of an honest organization.
- (Duval and Wicklund 1973; Wicklund 1975; Mazar et al. 2008; Hayley and Fessler 2005; Bateson et al. 2006; Pruckner & Sausgruber 2013)

A cautionary note…

- It could have been possible for signage to increase pollution and decrease compliance
  - Moral licensing: "I have warned stakeholders that I am polluting…"

  (Cain et al. 2005; Loewenstein et al. 2012)

What about the related empirical evidence on disclosure?

- Pessimistic results, on average, for:
  - corporate finance; campaign finance; medical malpractice; conflict of interest; homeland security threat warnings; emergency preparedness advisories; environmental health hazard advisories
- More mixed results, on average, for:
  - Product labeling and warnings, quasi-regulatory performance registries
- Favorable results for “name and shame” type programs.
  - Here, transparency leverages and complements formal regulation. Examples:
    - Restaurant hygiene grade cards (Jin and Leslie 2003, 2009)
    - Frequent violator or “watchlists” for polluters (Foulon et al. 2004; Evans 2016)
    - Community notifications of SDWA violations (Bennear & Olmstead 2009)

Effective disclosure programs often include:

- Mandatory, not voluntary, disclosure.
- Simple and standardized information.
- Information that harnesses communication technologies.
- Possibilities to leverage intermediaries (like watchdog groups).
- Information where and when decision-making occurs.
- Simple and specific information on how to respond; a clear and concrete action path from disclosure to outcomes of interest.

(Jin and Leslie 2005, 2006; Weil et al. 2006; Fung et al. 2008; Dranove and Jin 2010; Sunstein 2013)

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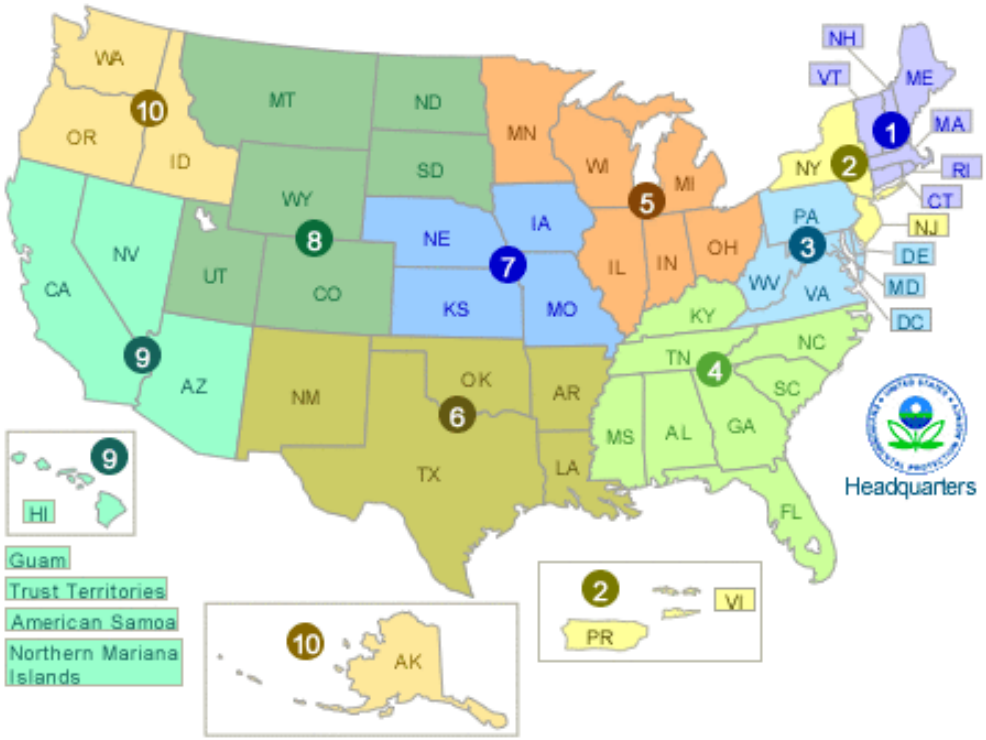
→ It is not clear (one way or another) that the Ohio signage program would influence pollution and compliance.

Step 2: Can we evaluate this program empirically?

- Can we plausibly assign causal attribution with an ex-post evaluation using observational data?
  - Programs may be implemented in conjunction with other policy changes
  - Programs may be instigated in response to changing compliance
  - Programs may be correlated with other factors that also directly influence pollution and compliance outcomes
  - It could be seriously misleading to collect data on facilities with signs and explore before vs. after policy changes in pollution.
- Are useful data available?

Research Design

- We attempt to assess causal impacts of the OH signage program with several research designs.
- We idea is a *“natural” experiment*: compare changes over time for a “experimental” group to changes over time for a “control” group.
- We exploit changes over time around the policy effective date for OH facilities vs. control facilities.
- We then exploit an institutional quirk of the program.



Intuition of the research design

- We compare:

  - before vs. after program effective date for OHIO (the treatment state)
  - After netting out ….
  - before vs. after program effective date for control states.

  - the effects of a permit status change after program effective date for OHIO
  - After netting out ….
  - the effects of a permit status change after program effective date for controls

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  - the effects of a permit status change after program effective date for controls
  - the effects of a permit status change within Ohio prior to effective date

Data

- Facility-by-month CWA (PCS-ICIS) data
  - Facility characteristics
  - DMR monthly discharges and limits for BOD and TSS
  - Permit events
  - Inspections and enforcement actions
- Supplemental Data
  - Demographics and weather data at the zip-code level
- Sample facilities
  - All NPDES “major” facilities in Region 5
  - Why majors?
  - Why all Region 5?

Preliminary results

- Violations for conventional water pollutants BOD or TSS fell significantly relative to a counterfactual.

- Average BOD and TSS pollution fell about 5% relative to a counterfactual.

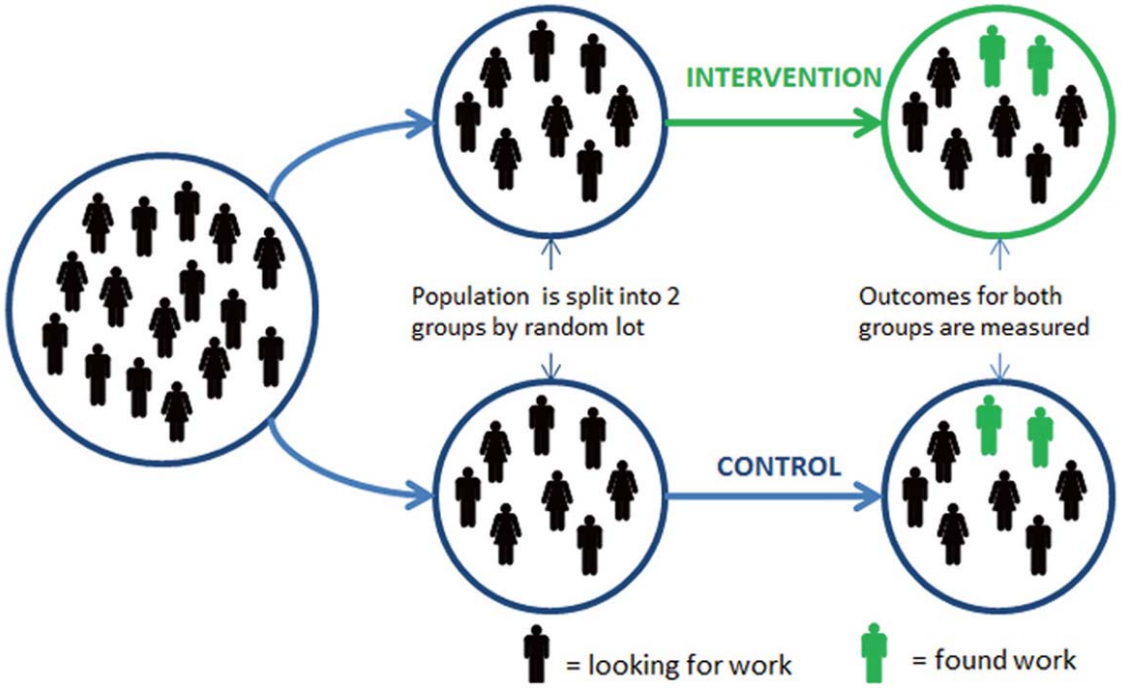
Step 3: Revisiting the Policy Framework

- Assessing the full welfare effects are beyond our scope.
- But …..
  - direct implementation costs are very low. We estimate typical compliance costs of < $600 one-time outlay per facility.
  - In contrast, associated changes in pollution and compliance are meaningful for at least some facilities. A benefits transfer is possible here (i.e. apply benefit estimates of $300 - $2000 / ton BOD or TSS).
  - With virtually any assumption asserting that reducing water pollution is a socially beneficial activity, signage programs are likely be cost effective relative to other water pollution programs (holding abatement costs constant across programs).

Some ex-post lessons

- This has been productive and fun for my colleagues and I.
- However, an evaluation partnership (beginning ex-ante) would have been preferable. This is generally true …
  - Better two way communication
    - Agencies get feedback on policy design and implementation
    - Agencies get a more reliable evaluation
    - Researchers get credible institutional knowledge and better data
    - Researchers produce more credible scholarship
  - Faster evaluation results
    - It's 2018. Credible results could have been available within months or years of the program implementation date.
  - More plausible causal attribution.
    - Our quasi-experimental "natural experiment" should be more credible than many natural evaluations.
    - A simple RCT would have been extremely fast, inexpensive, and reliable.

Randomized Controlled Trials (RCTs)



Source – In 2012, Laura Haynes, Owain Service, Ben Goldacre & David Torgerson "Test, Learn, Adapt: Developing Public Policy with Randomised Controlled Trials," as cited in Paul Ferraro (2017), "Evidence-based programs to improve compliance: testing ideas with experimental project designs."

Worth remembering: all agencies run many experiments every year….

- Source – McCracken, Teresa, as cited in Paul Ferraro (2017), "Evidence-based programs to improve compliance: testing ideas with experimental project designs."

Thanks! QUESTIONS or COMMENTS

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