Natural Experiments

Overview and Applications

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Today's Agenda
Natural Experiments

- **Overview**: What natural experiments are and why we should care.

- **Application #1**: Physical appearance and elections.

- **Application #2**: Income redistribution.

- **Application #3**: Origin of banking systems.

Overview

Overview
The nature of the treatment

- What's so "*natural*" about **natural experiments**?

  - It's all about the **"*nature*" of the treatment**:

    - These experiments are ***not*** "**designed/implemented**" by the researcher (**?**)
      Examples.

    - Treatment is assignment "**unknown**" ***and*** "**unknowable**" to the researcher (**?**)
      Examples.

- If you can't design one, and are unsure about the treatment, and the treatment doesn't depend on you, **how do *you* study causal effects using one?**

Overview
Randomization devices and unconfoundedness

- The _**only**_ **way to ensure unconfoundedness** is via a "**randomization device/procedure**" (**?**)

  - A **set of rules** that allows the researcher to **assign the treatment** according to a _**known**_ "**probability function**" (**?**)

  - What does a **known probability function ensure?**

  - Notice that the **researcher** must be able to **identify** the **probability distribution**, why**?**

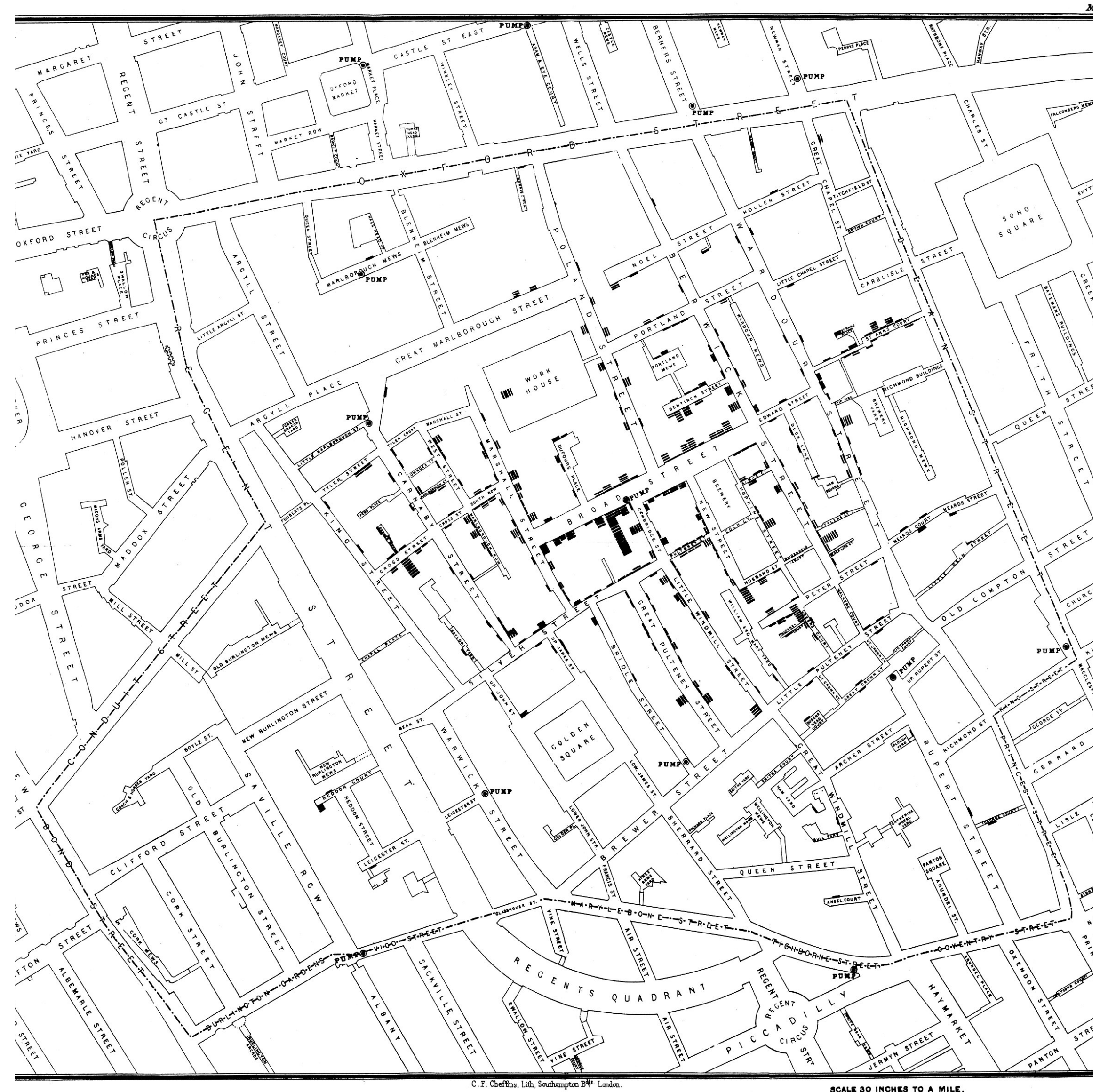# Overview
Defining a natural experiment

Randomization mechanism:

✓ Is not designed/implemented by the researcher.

✓ Is probabilistic by virtue of an external "device."

✓ Is unknown and unknowable.

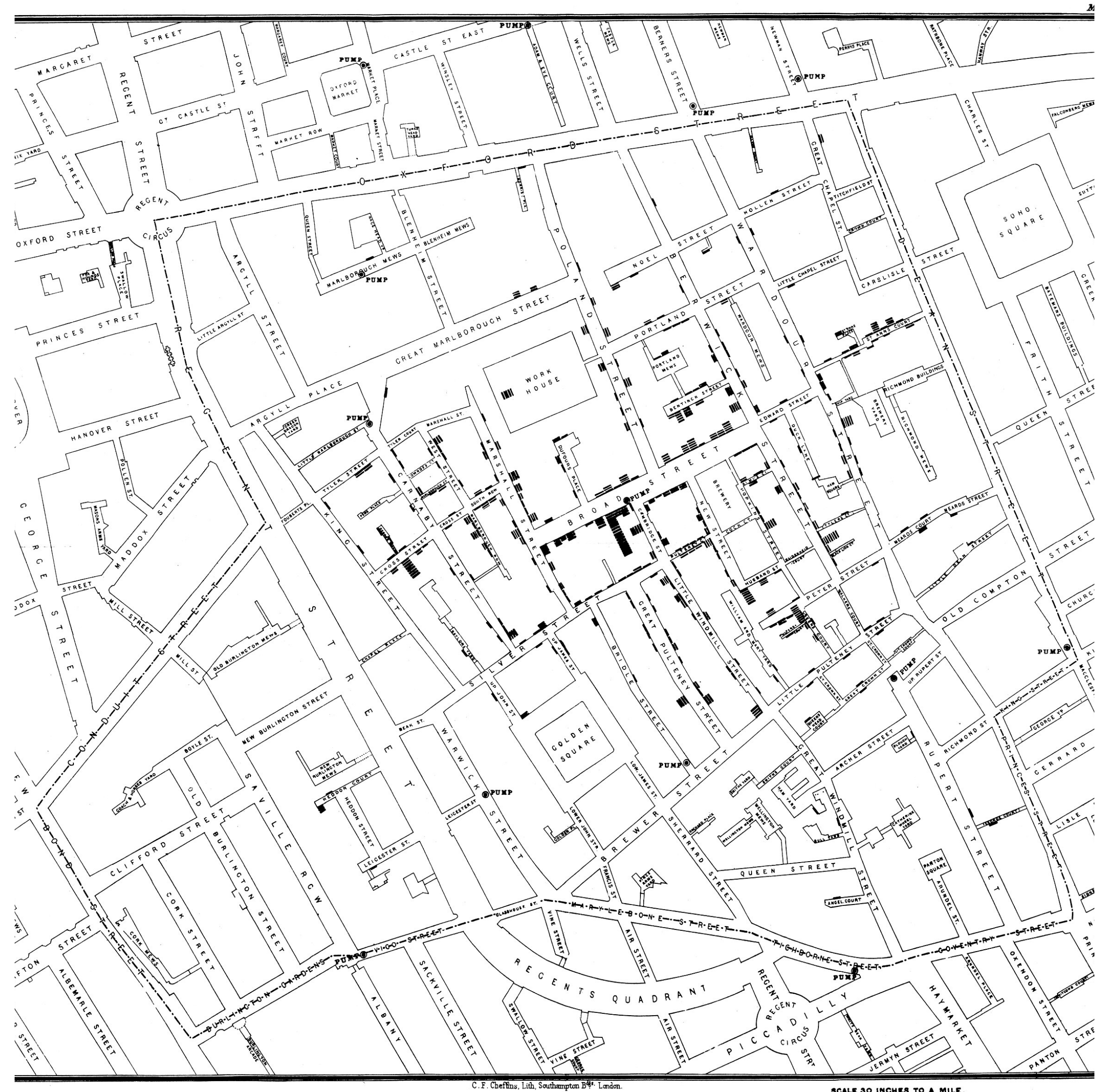◉ **What's this map?**

Overview
Defining a natural experiment

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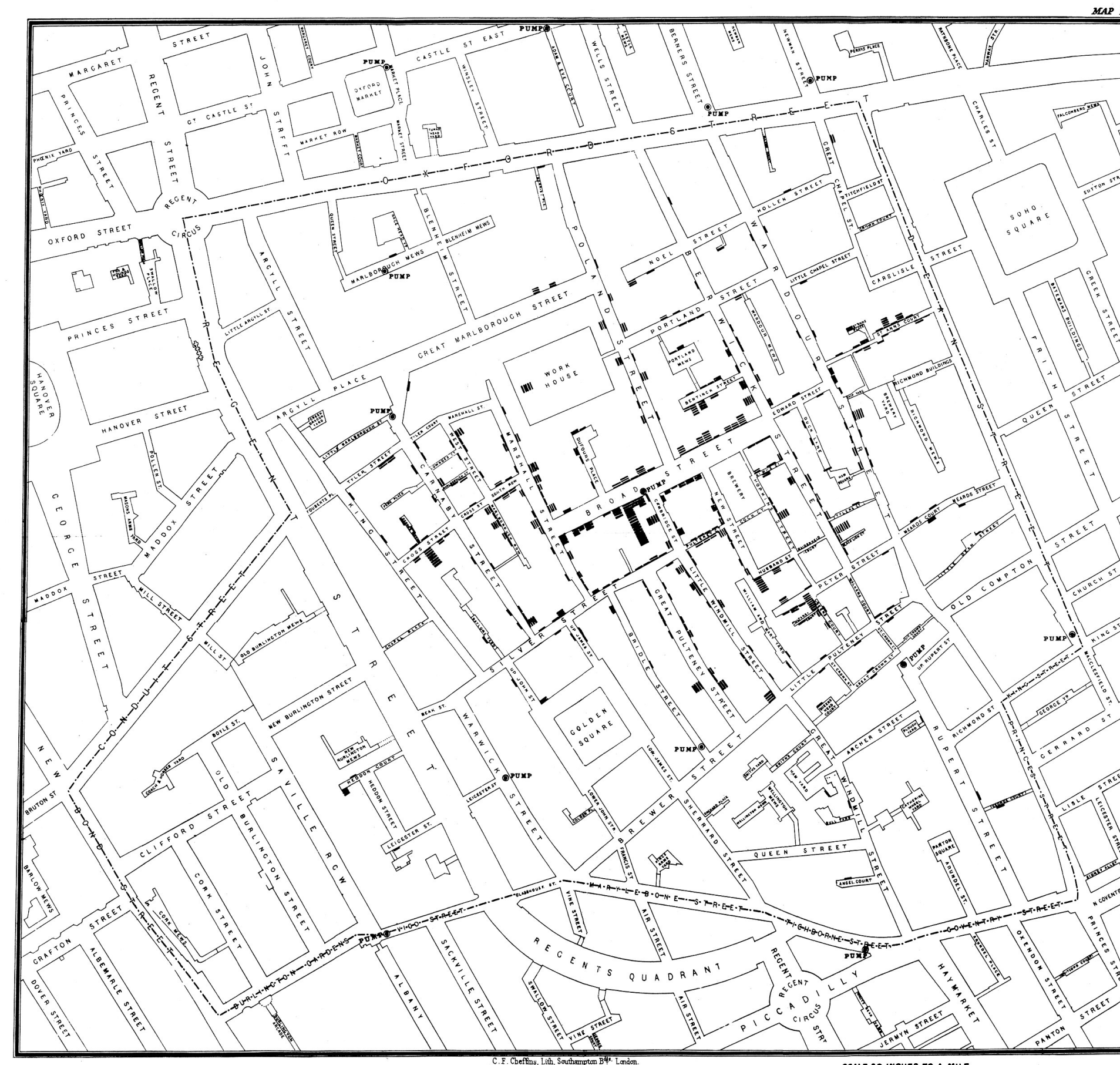
◉ **What's this map?**

John Snow's map showing the clustering of cholera cases in Soho during the London epidemic of 1854
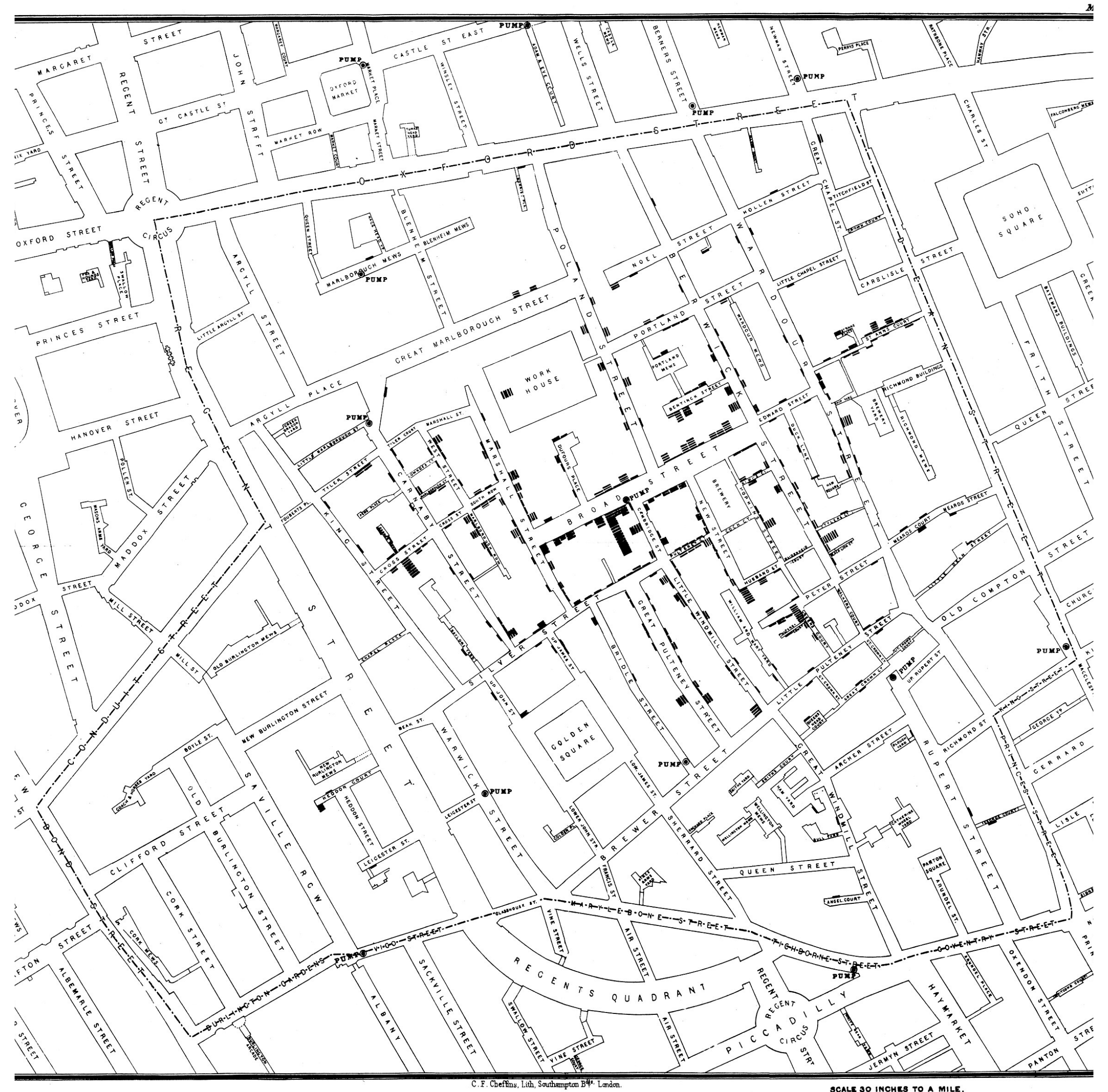
What *causes* cholera?

A study of water supply and miasma in London, 1854

Overview

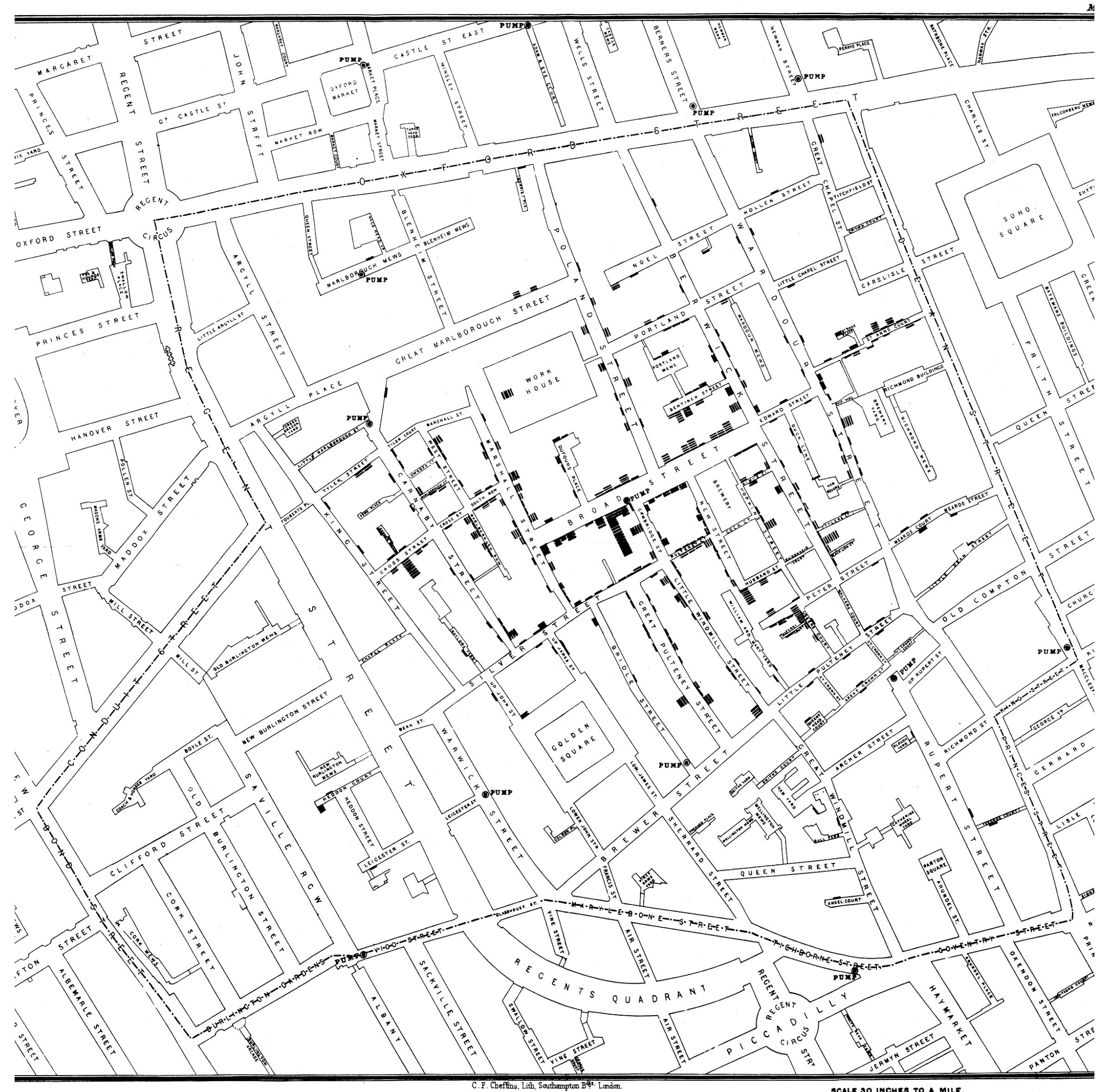**Was Snow's design a natural experiment?**

John Snow's map showing the clustering of cholera cases in Soho during the London epidemic of 1854

Overview

Was Snow's design a natural experiment?

Randomization mechanism:

▸ **Was it designed/implemented by the researcher?**

▸ **Was it probabilistic by virtue of an external "device"?**

▸ **Was it unknown and unknowable?**

John Snow's map showing the clustering of cholera cases in Soho during the London epidemic of 1854

In a natural experiment […] the researcher **finds** some intervention that **has been implemented** and also finds some subjects. She then constructs treatment and control groups to address a particular hypothesis. **But the treatment and control groups are constructed *post hoc*.**

Since unconfoundedness is unguaranteed
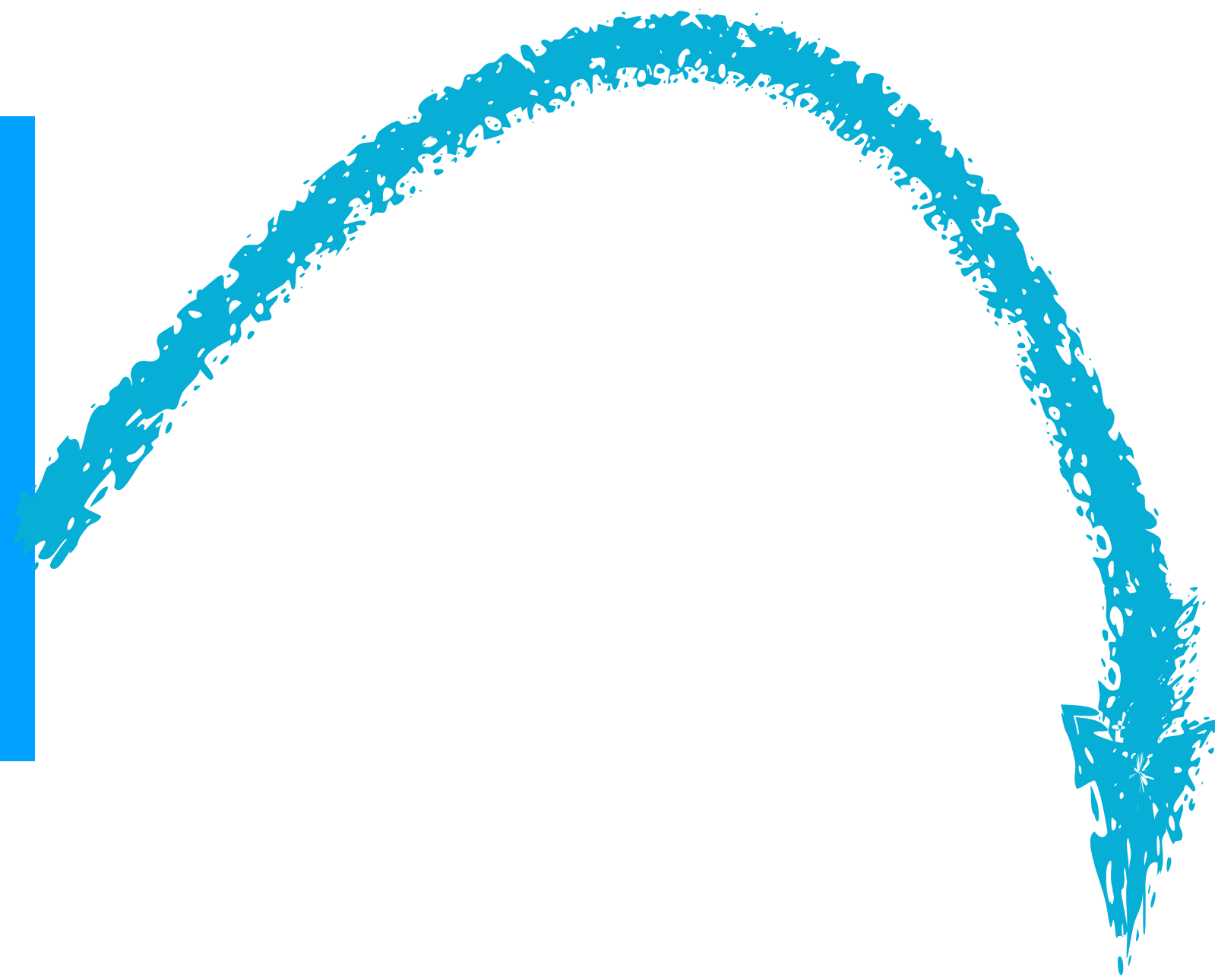
Natural Experiments are a subclass of "observational study" (?)

Overview

Natural experiments: A subclass of observational study

If certain **assumptions** **hold**, we can **claim** we have a natural experiment.

Randomization mechanism:

- Is not designed/implemented by the researcher.

- Is probabilistic by virtue of an external "device."
  Researcher must <u>persuade</u> us.

- Is unknown and unknowable.
  Researcher must <u>persuade</u> us
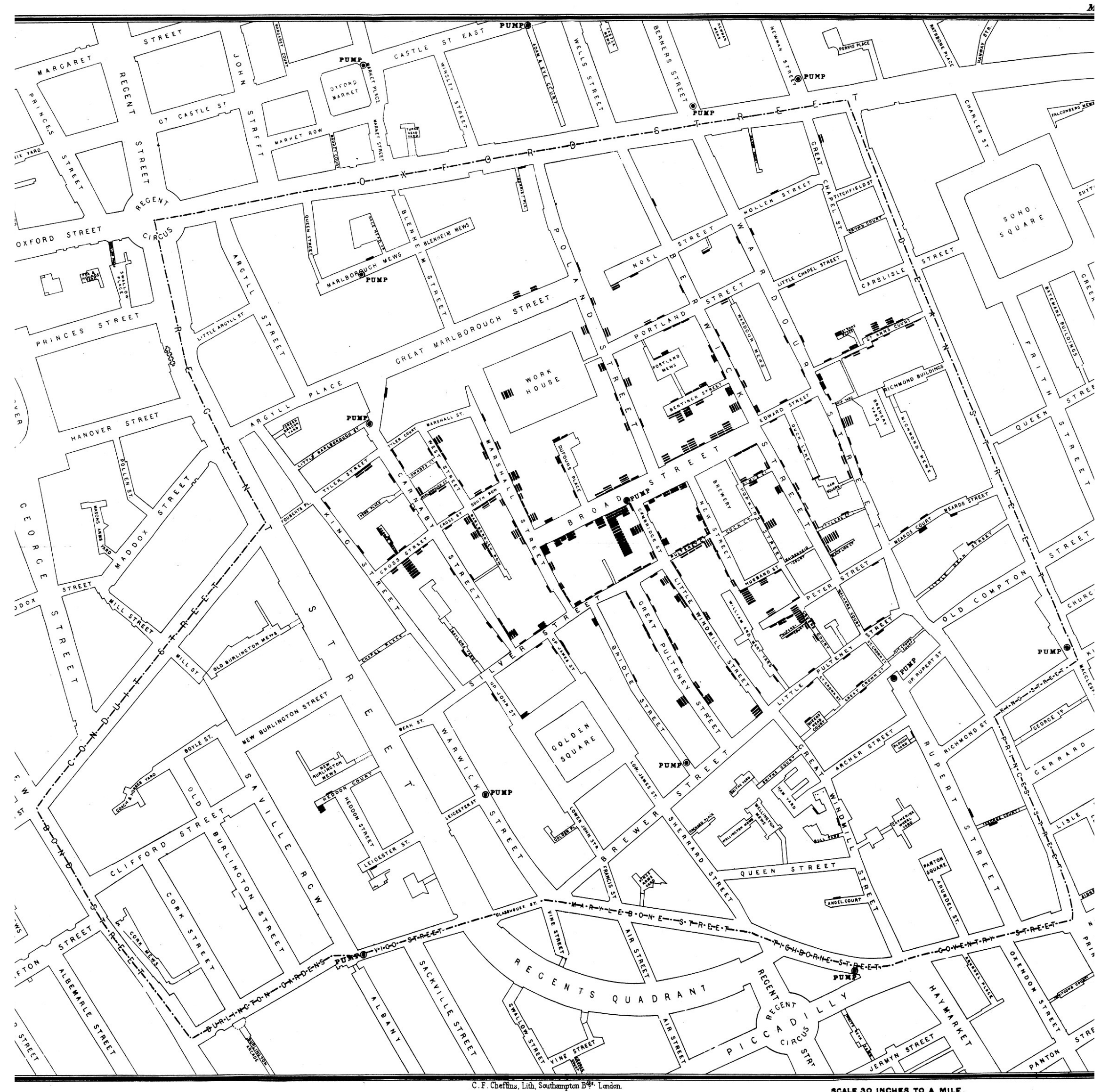
John Snow's map showing the clustering of cholera cases in Soho during the London epidemic of 1854

"Various forms of **quantitative and qualitative evidence**, including detailed knowledge of the process that led to treatment assignment, must be used to evaluate the claim [of '*as-if random*']"

"**Natural experiments**" are then **caused by social and political forces** (not "natural ones). They are not true experiments (they are a sub-class of observational studies). **Then "natural experiments" are neither "natural" nor "experiments."**
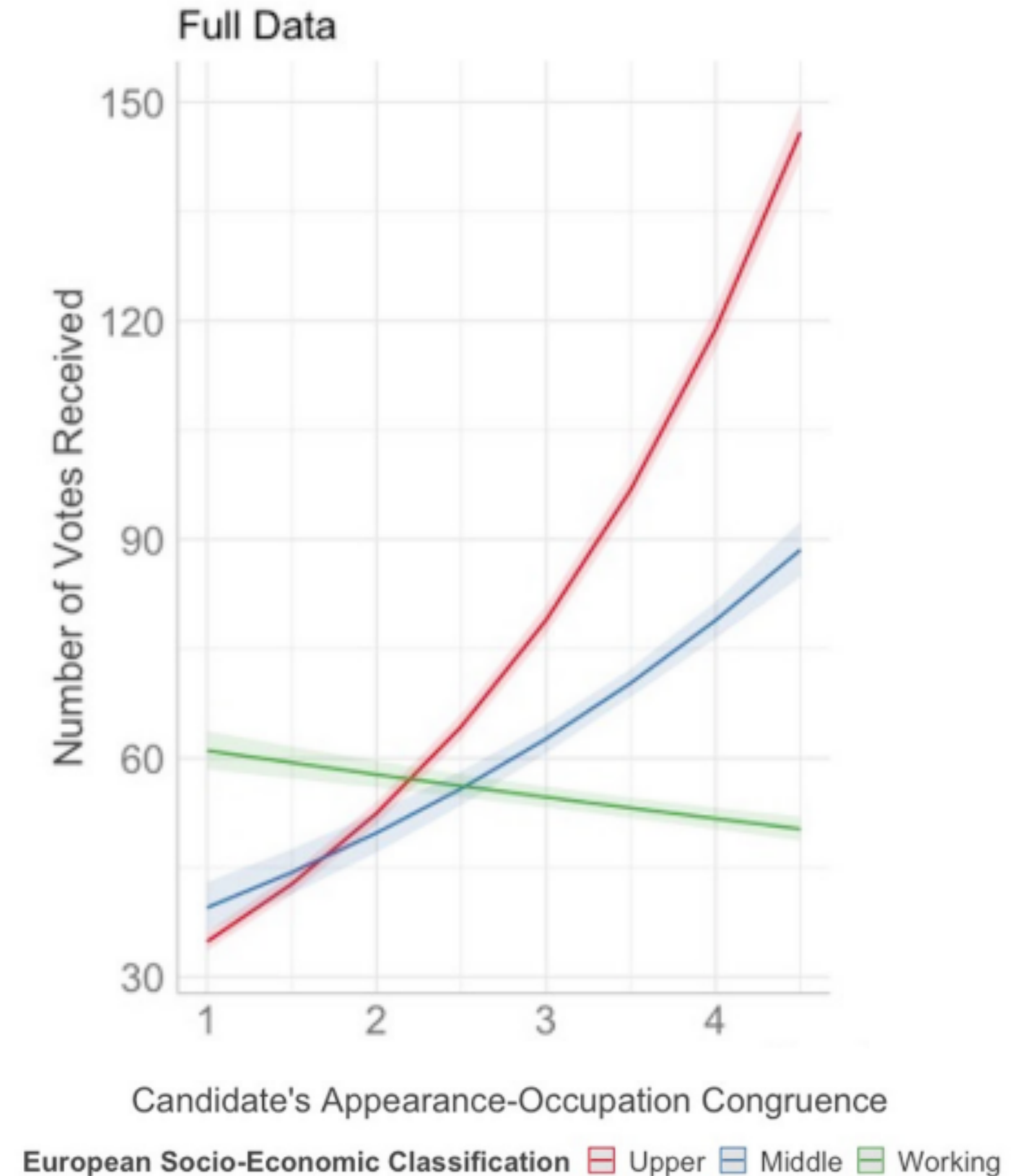
Physical Appearance and Elections

Application #1

Elections
Overview

- **Gist**: What do the authors find**?**

  - Working-class **appearance** negatively affects the number of **votes** received in Finnish municipal elections.
    This relationship affects *only* female candidates.

- Is this a natural experiment**?**
  Is there any randomization process, and if so, what's being randomized**?**

- Is this design "better" than a non-experimental (i.e. purely observational) design**?**
  Think of a survey.

Full Data

Number of Votes Received vs. Candidate's Appearance-Occupation Congruence

European Socio-Economic Classification — Upper, Middle, Working

Elections
Design: empirical advantages

What's to like about this piece? **Possible** *as-if* random assignment of "physical appearances" to political candidates.

○ What do the following features achieve**?**

- Extensive usage of **public posters** as the *only* means of campaigning.

- The design exploits a **real situation**, with **real outcomes** and **actual behavior**.

Elections
Design: what could go wrong?

- You can see the authors **are really trying** to make the case that:

  1. There was *no* "**omitted variable bias**" (**?**)

     - **Assumption** that there is no "**private information**" (i.e. "gossip effects").
       Voters get "treated" *only* with posters (and no other alternatives sources of campaigning).

       - What could happen if there is **private information?**

       - Do the authors **solve** this potential **source of omitted variable bias?**

  2. There was *no* "**self-selection bias**" (**?**)

     - Only attractive individuals could **self-select** into political campaigning.
       What do the authors say?

Income Redistribution

Application #2

Income Redistribution
Overview

- **Gist**: What do the authors find**?**

  - **Lottery money**:

    1. **Increases hostility** towards **taxation**.

    2. **Increases hostility** towards **redistribution**.

    3. **Does not affect** attitudes concerning **socio-economic stratification**.

- Is this a natural experiment**?**
  What's being randomized?

- Is this design "**better**" than a non-experimental (i.e. observational) design**?**
  Think of a survey.

Income Redistribution
Design: empirical advantages

What's to like about this piece? Income is **widely used** in social sciences. However, **it is never random**. Thus, income is usually **correlated** with something else. In this design, however, we can ask a super interesting question:

*Does randomly assigned income **causally change attitudes towards redistribution?***

What's neat about this piece is that:

- Lotteries *are* **random**.

- Authors exploit amount of the prize (i.e., ***continuous* non-binary treatment**).
  Unequal and random alterations in income.

Income Redistribution
Design: what could go wrong?

Is this piece perfect, though? What could go wrong?

- You can clearly see the authors struggled with the following:

  - "**Demand bias**": the authors had to **interview** prize winners and **ask them directly** about their **attitudes towards redistribution**.
    What could go wrong here?

  - "**Sample attrition**": *some* prize winners **did not want to be interviewed**.
    Is that a problem?

  - **Different *marginal utilities* of prize winners**: Does the same dollar awarded satisfies you the same, regardless if you are poor or rich?

Origin of Banking Systems

Application #3

Origin of Banking Systems
Motivation

- Some countries have a lot of banks, some others have just a few. Why care**?**

  - More banks means wider access to credit.
    More market competition, lower interest rates, wider access to credit, less inequality.

- This piece explains that countries "***treated***" with **democracy** incentivize the development of the banking system, as opposed to "***control***" countries that remain **undemocratic**.

Origin of Banking Systems
Setup

- As in any experimental setup, it is important to claim "**covariate balance**" (**?**).

- What does the author do to claim (*some*) covariate balance**?**

  - "[the United States, Brazil, and Mexico] *All three* countries began their existence as independent nations without preexisting banking systems because their colonial powers did not permit the chartering of banks. *All three* obtained independence within a few decades of one another, and *all three* new governments needed banks in order to finance their operations."

- If you notice, "**natural experiments of history**" do *not* necessarily require numbers or stats.
  It relies on a reasonable narrative.

Origin of Banking Systems
Causal Mechanism

- In natural experiments of history, the analyst finds and justifies what might be a **necessary condition to observe the effects of a treatment**.

- In this case, these are:

  - "**conditions** [that] are associated with political institutions that simultaneously **limit the authority** and discretion of public officials, allow the users of credit the **right to vote**, and provide the owners of financial assets with the ability to **veto the redistributionist urges of voters**."
  Examples of such institutions?

  - **A democratic constitution and a democratic Congress**. Why**?**

    - These are institutions **spread political power** among people (non-elites), **reducing the probability of expropriation**.

    - **Since these institutions spread power, they also limit initial monopolies, allowing market competition (good for borrowers).**

Origin of Banking Systems
Causal Mechanism

- Direct implication:

  - Countries that failed to implement such institutions: **no incentives to open up banks (fear of expropriation).**
    Less banks, less access to credit, only the wealthy can invest, more inequality (Brazil and Mexico).

  - Countries that succeed at implementing such institutions: **if property rights are in place**, there is no fear of expropriation.
    More banks, more access to credit, investment is widely spread out, less inequality (U.S.).

Thus, in natural experiments of history, the analyst finds a case, and justifies a "treatment"

What can go wrong?

Since the analyst does not control the treatment, this is no different than an observational study

Treatment, control, and treatment assignment are justified in a narrative way

Natural Experiments
Discussion

- Today we reviewed one natural experiment where nature randomly assigned physical appearances. One lottery study (with a known probability distribution). And one "natural experiment of history."

- **Typical natural experiments** are excellent tools to observe whether the treatment has any effect on the sample of interest.

- Unfortunately, while questions tend to be **relevant**, they can be **too narrow and too local**:

  - **The effect of introducing co-payments for malaria mosquito netting**.

  - **Changes in electoral rules on ethnic voting**.

    These are interesting questions, but **not the type of big questions** social scientists traditionally used to ask.

  - Thus, a possible critique is that these questions and findings do *not* "**aggregate into broader knowledge**."

Thank you