



DATA 1202
Spring 2024

Lecture 2

Cause and Effect

Announcements

- **Lab 01** meets Thursday 1/11 @ 11am
 - Lab 01 worksheet will be completed and signed off in class
 - Lab 01 notebook should be completed in class and is due by 1/12 @ 5pm
- **Homework 01** will be released at the end of lab.
 - Due 11 PM Wednesday 1/17

Regularly Eating Chocolate Is Linked to 8 Percent Lower Heart Attack Risk



By [Lisa Rapaport](#)

Reviewed: July 23, 2020

Report on a July 2020 article
in the European Journal of
Preventive Cardiology



<https://journals.sagepub.com/doi/full/10.1177/2047487320936787>

<https://www.everydayhealth.com/diet-nutrition/eating-chocolate-regularly-linked-to-lower-heart-attack-risk/>

Observation

- **individuals**, study subjects, participants, units
 - *336,289 US, Swedish, and Australian adults in several studies*
- **treatment**
 - *chocolate consumption*
- **outcome**
 - *heart disease*

The first question

Is there **any relation** between chocolate consumption and heart disease?

- **association**
 - any relation
 - link

Answer: Yes, because those who ate chocolate had less heart disease.

A Stronger Link?

Other headlines about the same article:

Chocolate is good for the heart

22 Jul 2020

European Society of Cardiology Press Release

Is eating chocolate heart-healthy? Study says 'yes'

August 26, 2020

No Comments



Family Safety and Health, National Safety Council

<https://www.escardio.org/The-ESC/Press-Office/Press-releases/Chocolate-is-good-for-the-heart>

<https://www.safetyandhealthmagazine.com/articles/20257-is-eating-chocolate-heart-healthy-study-says-yes>

The next question

Does chocolate consumption **lead to** a reduction in heart disease?

- **causality**

This question is often harder to answer.

“Dr. Alice Lichtenstein, an American Heart Association volunteer and professor of nutrition science and policy at Tufts University, was more skeptical of the findings.”

Market Watch

<https://www.marketwatch.com/story/eating-chocolate-once-a-week-can-lower-your-risk-of-heart-disease-study-2020-07-23>

Association

London, early 1850s



A COURT FOR KING CHOLERA.

Illustration from *Punch*
(1852)

Miasma

- **Bad smell** given off by waste and rotting matter
- **Believed to be the main source of disease**

- Believers included:
 - Florence Nightingale
 - Edwin Chadwick, Commissioner of the General Board of Health

Suggested Remedies

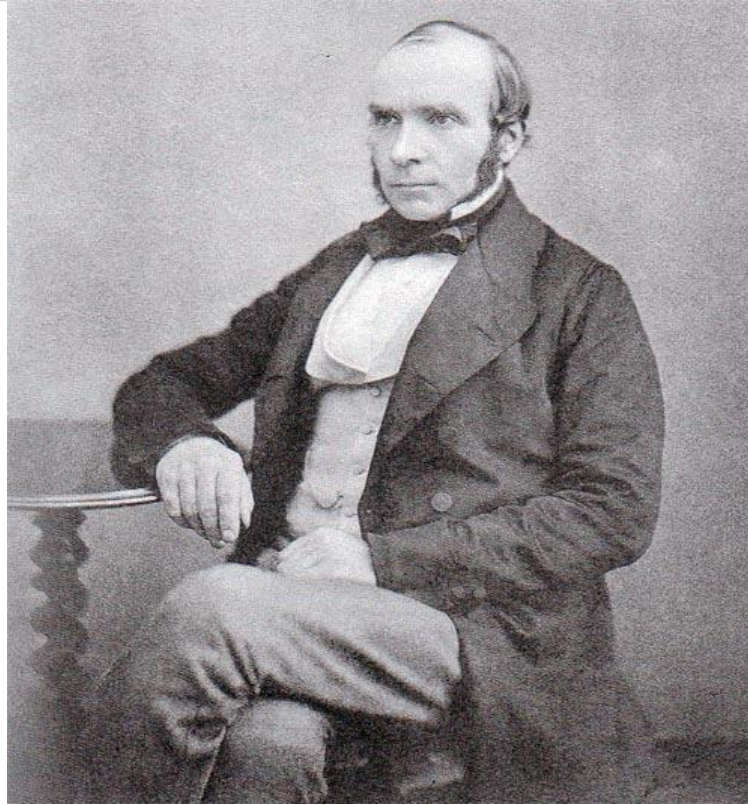
Cholera, around 1850

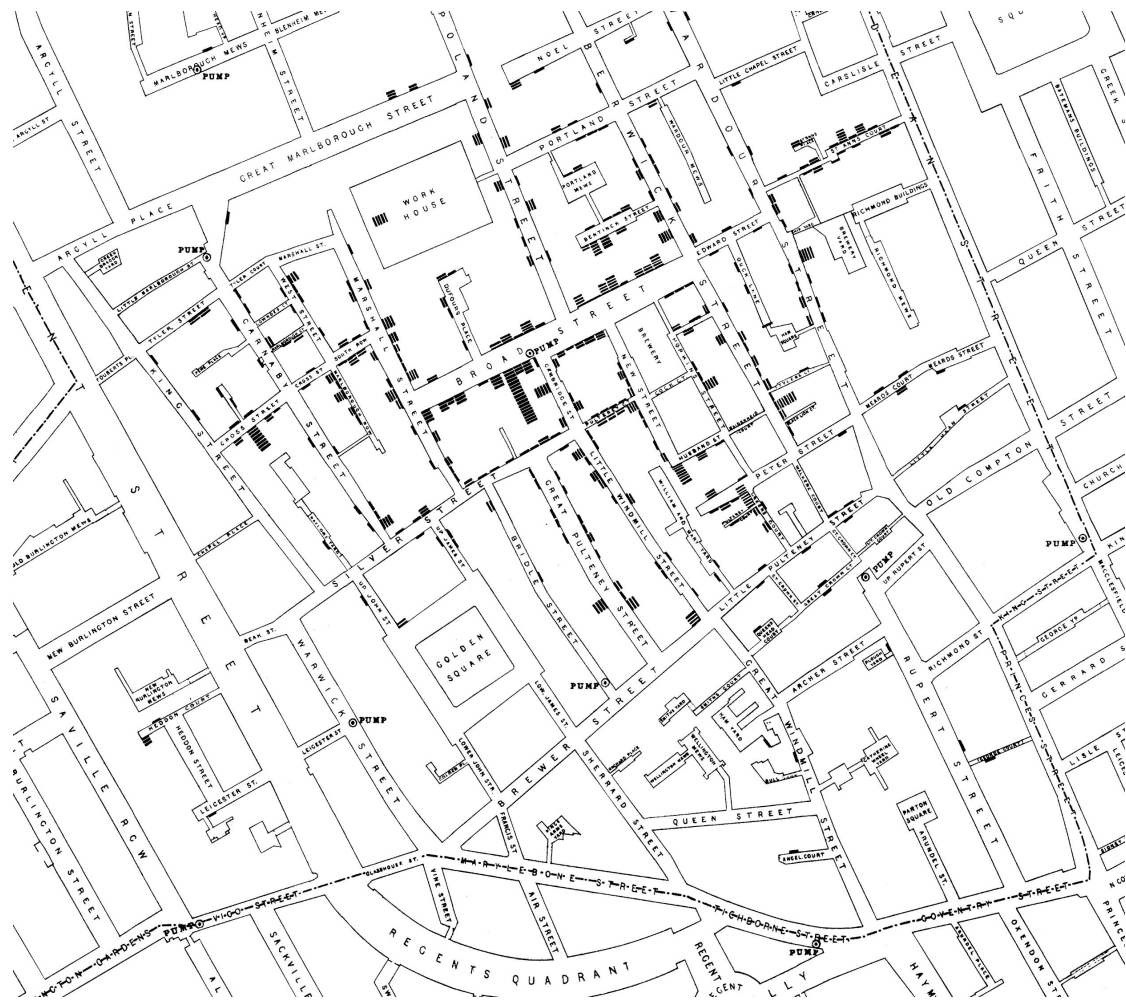
- “fly to clene air”
- Fire off barrels of gunpowder
- Fetch clean air from the top of the Eiffel Tower in Paris

Covid19, 2020

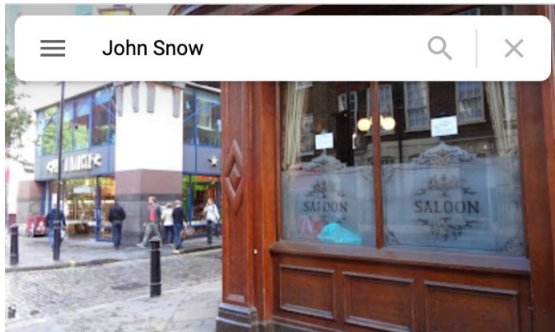
- Inject disinfectant
- Sunlight
- Hydroxychloroquine
- Take 6 deep breaths, then cough while covering mouth
- Cannabis, cocaine, mangoes, onion, garlic, drinking water every 15 minutes, tea, eating ice cream, avoiding ice cream

John Snow, 1813-1858









John Snow

4.2 ★★★★★ 1,191 reviews · \$

Pub



Directions



Save



Nearby



Send to your
phone



Share

Dark-wood saloon bar serving Yorkshire ales, named after doctor who traced London cholera outbreak.

✓ Dine-in · ✗ Takeout



39 Broadwick St, Carnaby, London W1F 9QJ,
United Kingdom



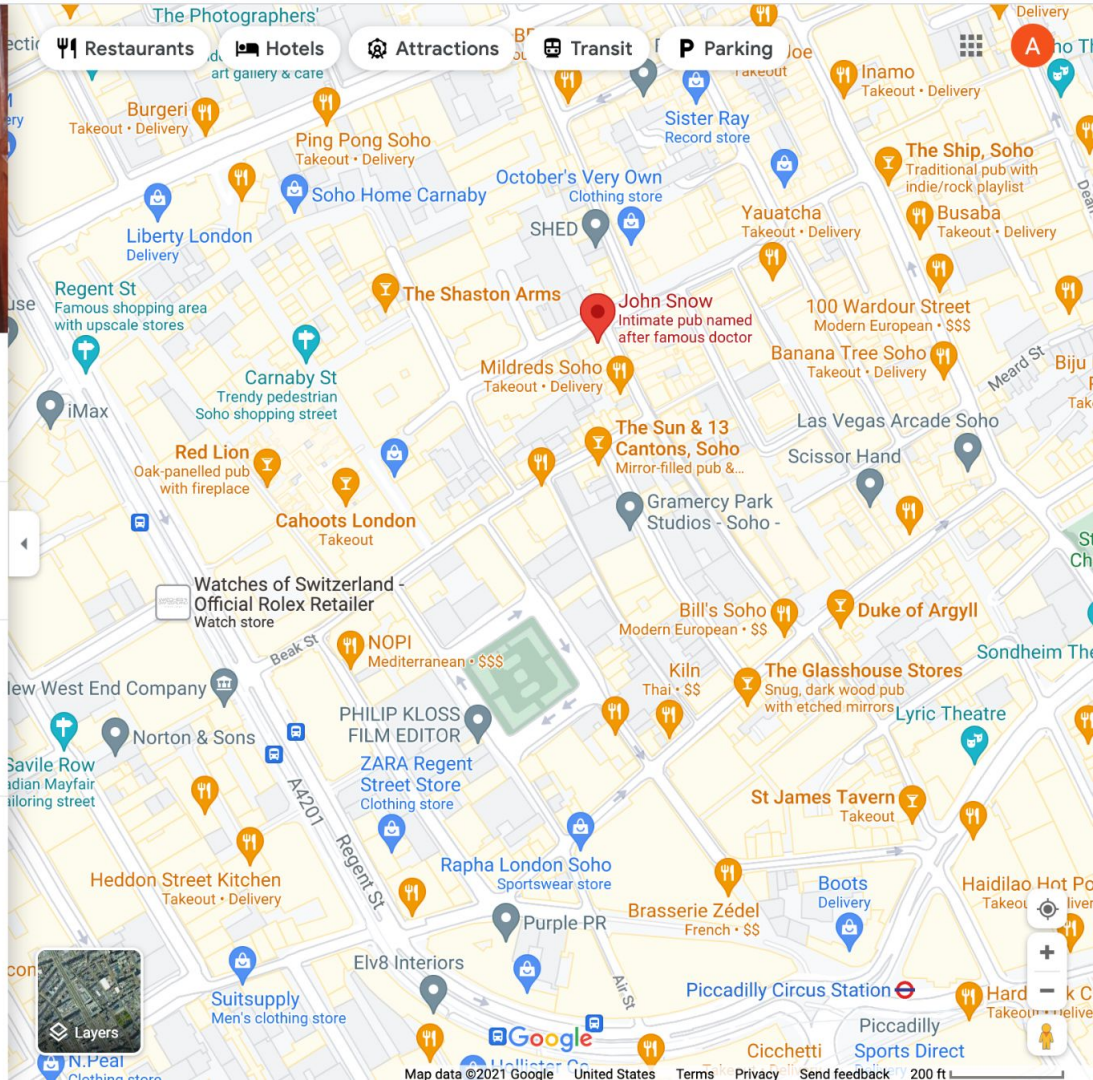
Closed. Opens at 12:00 PM



Health & safety: Mask required · Staff required to
disinfect surfaces between visits



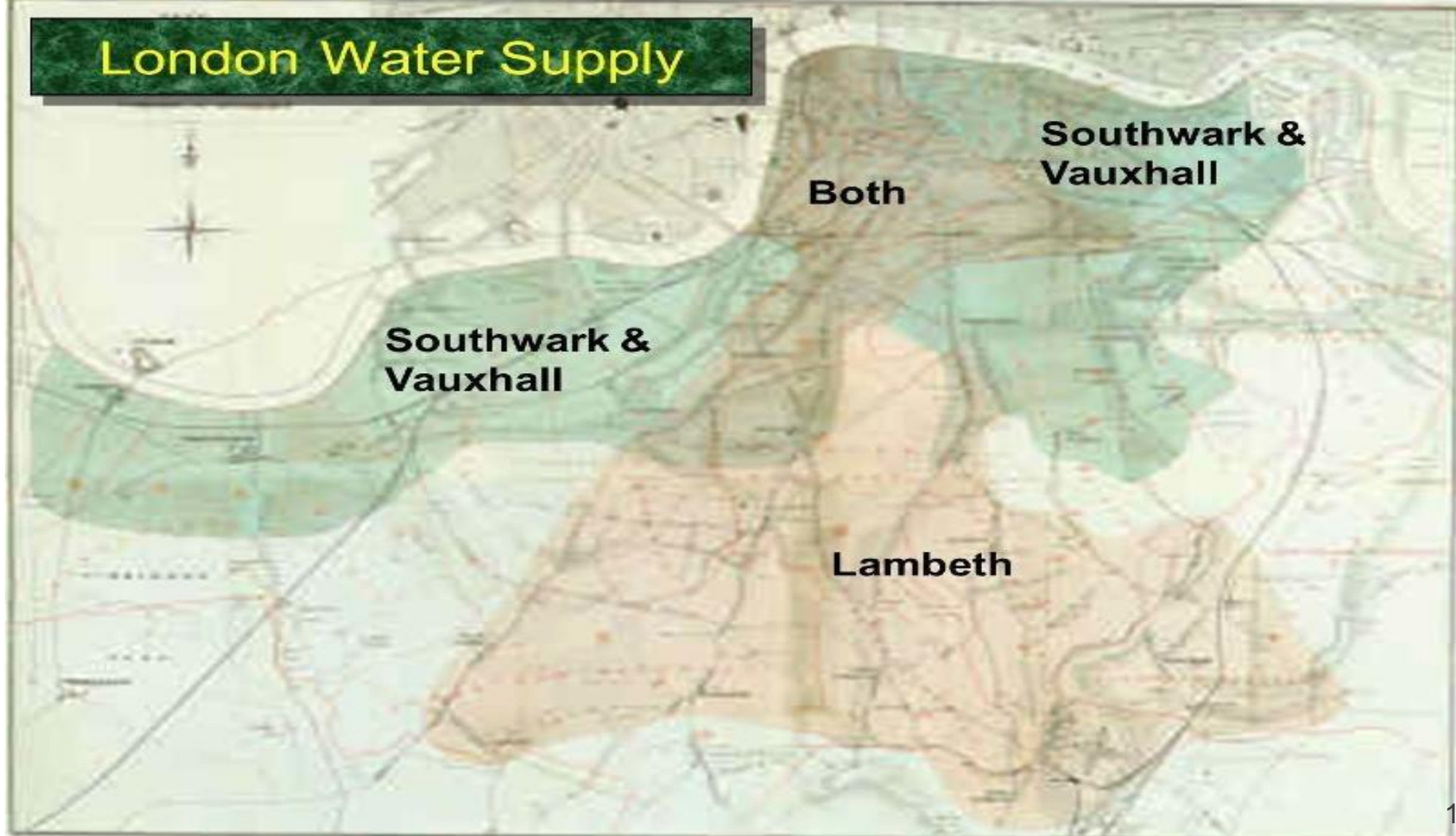
m.facebook.com





Causation

London Water Supply



Comparison

- **treatment group**
- **control group**
 - does not receive the treatment

Snow's “Grand Experiment”

“... there is no difference whatever in the houses or the people receiving the supply of the two Water Companies, or in any of the physical conditions with which they are surrounded ...”

- The two groups were *similar except for the treatment*.

Snow's table

Supply Area	Number of houses	Cholera deaths
S&V	40,046	1,263
Lambeth	26,107	98
Rest of London	256,423	1,422

Snow's table

Supply Area	Number of houses	Cholera deaths	Deaths per 10,000 houses
S&V	40,046	1,263	315
Lambeth	26,107	98	37
Rest of London	256,423	1,422	59

Key to establishing causality

If the treatment and control groups are *similar apart from the treatment*, then differences between the outcomes in the two groups can be ascribed to the treatment.

Confounding

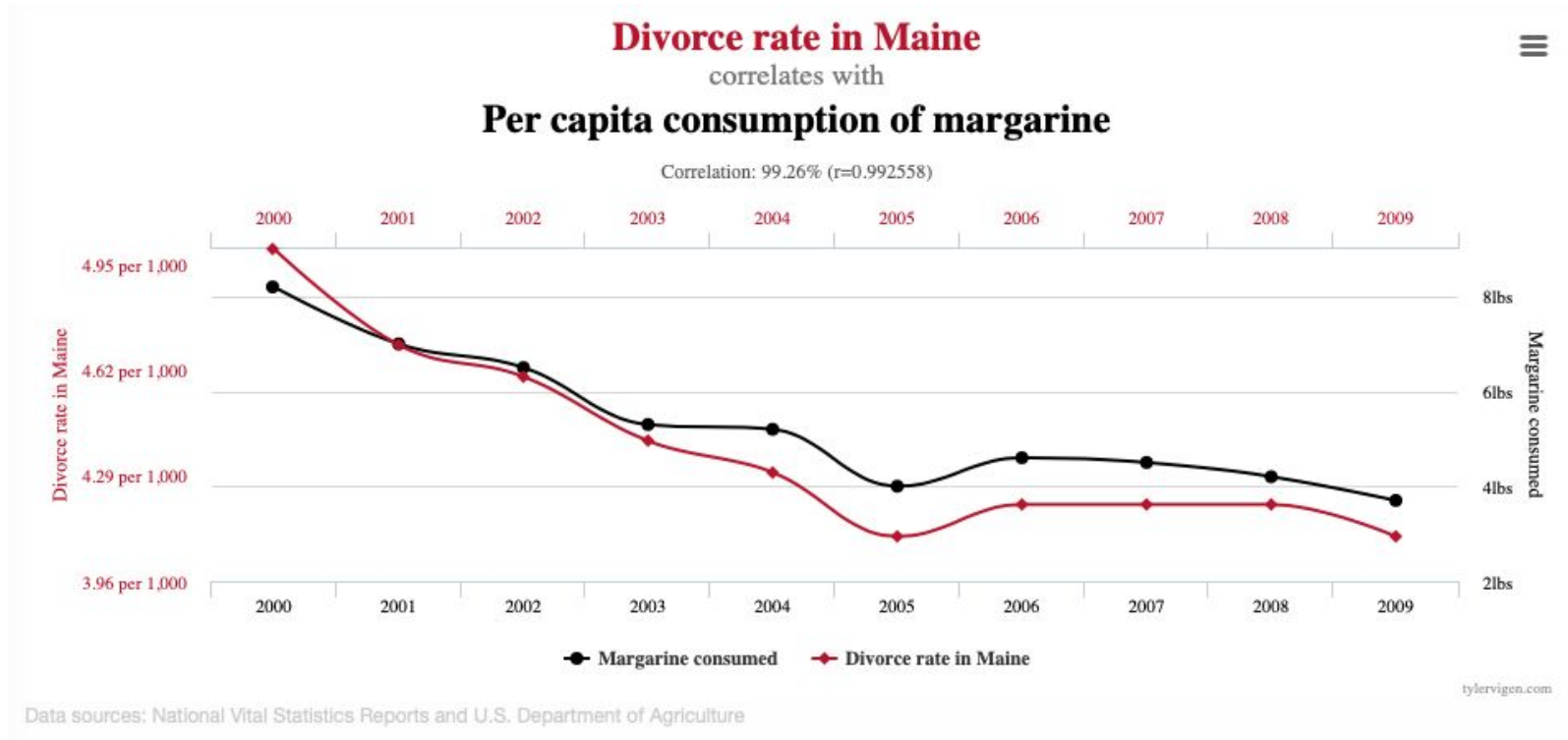
Trouble

If the treatment and control groups have **systematic differences other than the treatment**, then it might be difficult to identify causality.

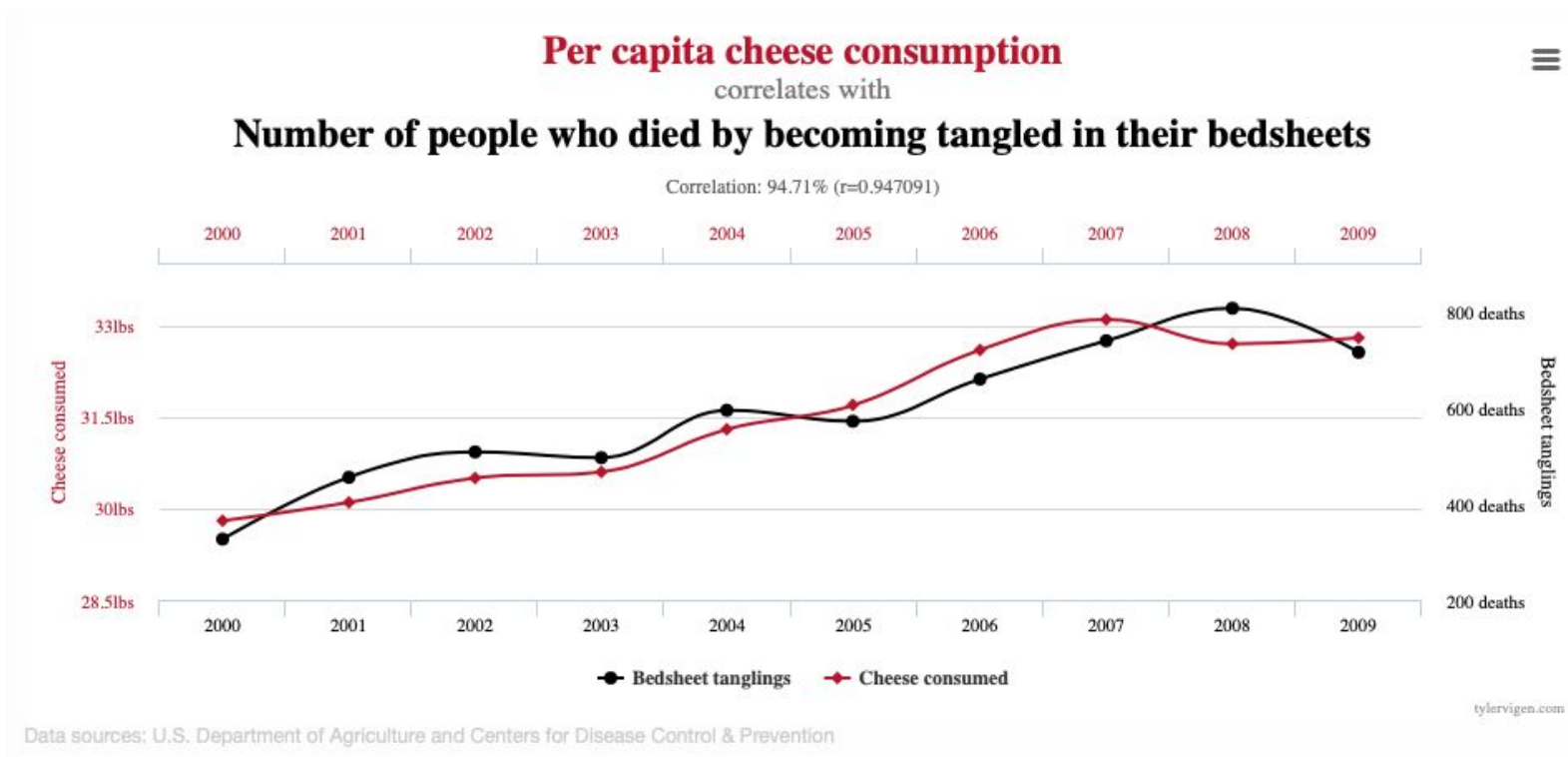
Such differences are often present in **observational studies**.

When they lead researchers astray, they are called **confounding factors**.

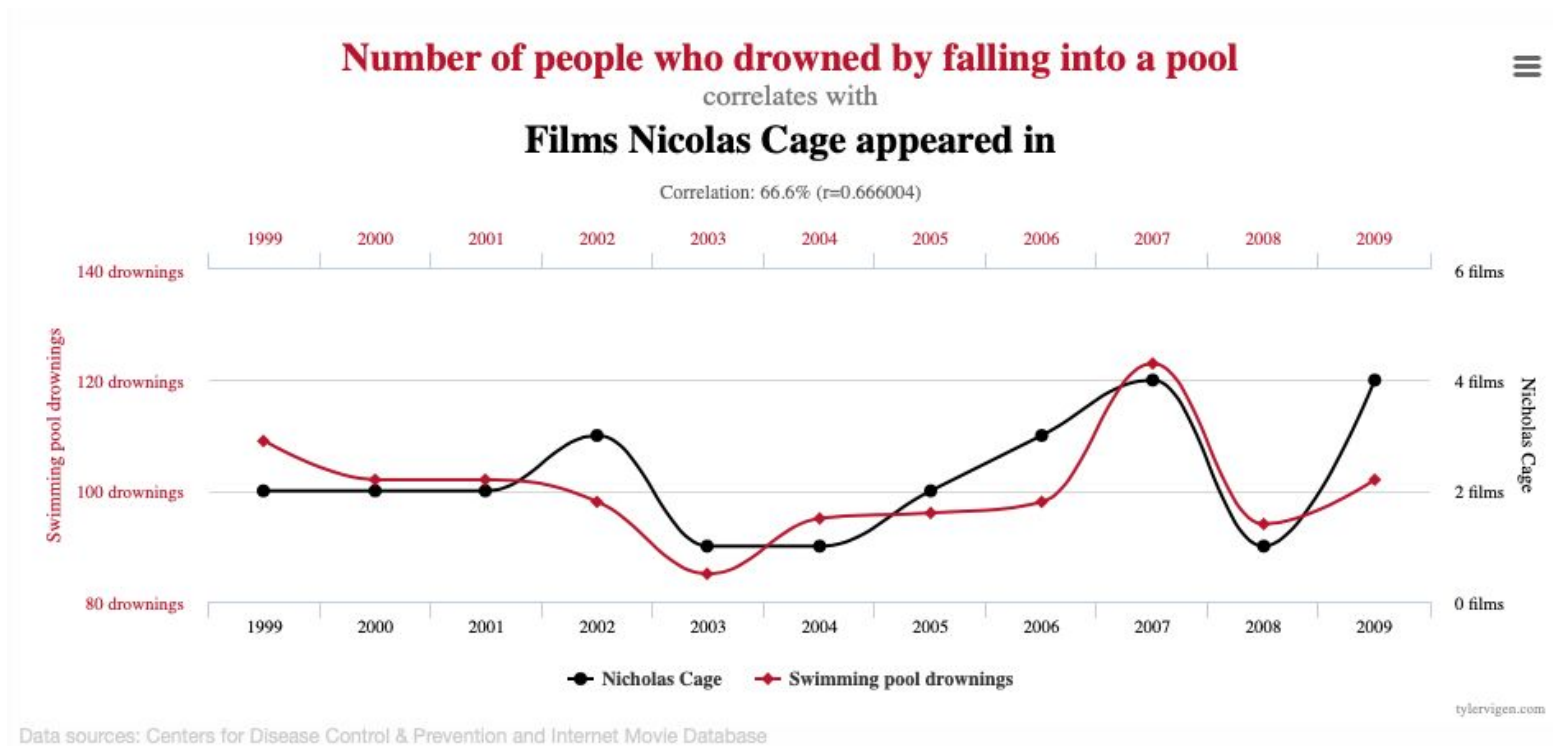
Example of Confounding



One More



Another One



Randomize!

- If you assign individuals to treatment and control **at random**, then the two groups are likely to be similar apart from the treatment.
- You can account – mathematically – for variability in the assignment.
- **Randomized Controlled Experiment**

Careful ...

Regardless of what the dictionary says,
in probability theory

Random \neq Haphazard