Book group

Chapters 3 - 4

Four stages of inference

1. Raw data
2. True value in the sample
3. True value in the sampling frame
4. True value in population

Steps to infer

1 -> 2. People may lie, or be mistaken

2 -> 3. The sample must be truly random, and missingness must also be random

3 -> 4. The sampling frame must be valid

What can go wrong?

1 -> 2 Observations need to be:

Reliable = repeatable (although the mean of an unbiased measure tends towards the true mean)

Valid = measure what you want to measure

Survey methodology can lead to bias- e.g. priming

1. Who would you rather see fix our Nation's shattered immigration policies?

- ○ President Trump
- ○ A MS-13 Loving Democrat

2. Who do you trust more to protect America from foreign and domestic threats?

- ○ President Trump
- ○ A Corrupt Democrat

3. Who would you rather handle our Nation's economy?

- ○ President Trump
- ○ A Radical Socialist Democrat

4. Who do you believe is more transparent with the American People?

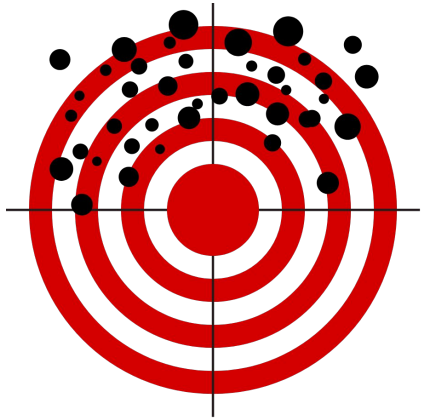
- ○ President Trump
- ○ A Lying Democrat

5. Who do you trust to NOT raise your taxes?

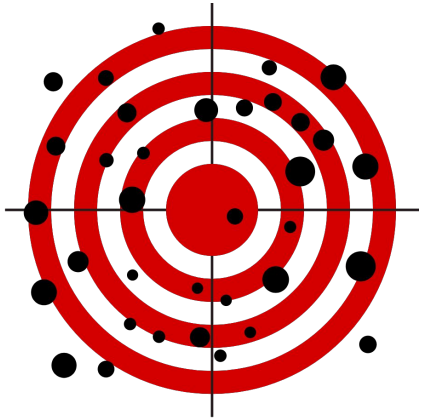
- ○ President Trump
- ○ A High Tax Democrat

6. Who do you believe will ALWAYS put America FIRST?

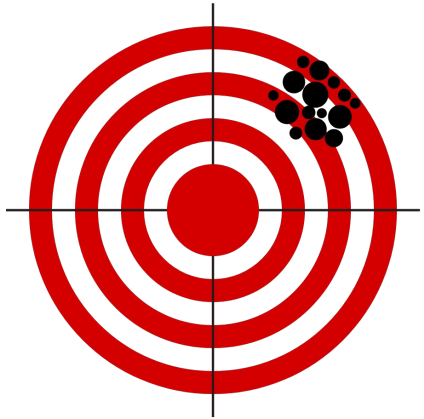
- ○ President Trump
- ○ A Sleazy Democrat



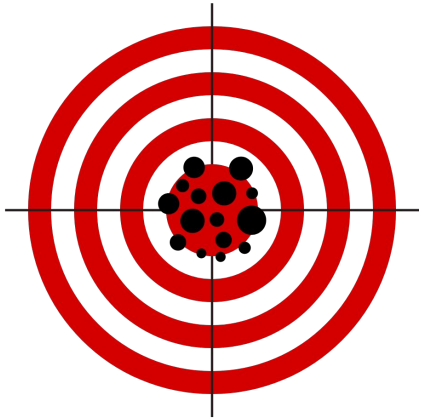
Unreliable & Unvalid



Unreliable, But Valid



Reliable, Not Valid



Both Reliable & Valid

What can go wrong?

2 -> 3. Randomness is key here. Gallup said you don’t have to sample the whole of a pot of soup but you have to give it a good stir

E.g. 2015 general election they rang landlines and only *10%* answered

In more recent times there have been problems with polling online and adjusting for that bias

What can go wrong?

3 -> 4. External validity. Are we answering the question we think we're answering?

E.g. testing drugs on mice.

Testing psychology experiments on people who are WEIRD (Western, educated, industrialized, rich and democratic https://www.apa.org/monitor/2010/05/weird)

Crime survey versus police recorded crimes

Normal distribution

The normal distribution allows us to summarise a lot of data (e.g. heights) with just two parameters- mean and standard deviation

(poisson beats that with one parameter 😄)

Often in healthcare we have population statistics- e.g. length of stay on a ward. However, we can still use statistics if we reframe the LOS as a sample of all the wards that could have existed

Chapter 4- what causes what

Corrleation != causation

Causation is frequently complex. Smoking only increases the probability of lung cancer and does not guarantee it

(although have a read of this randomised controlled trial of parachutes which concluded that parachutes do not work! https://www.bmj.com/content/363/bmj.k50)

Clinical trials

- Controls
- Equal groups (only possible with randomisation)
- Intention to treat analysis
- Blind
- Double blind
- If possible those assessing the final outcome also blind
- Measure everyone, including drop outs
- Don’t rely on single study
- Systematic review and meta analysis

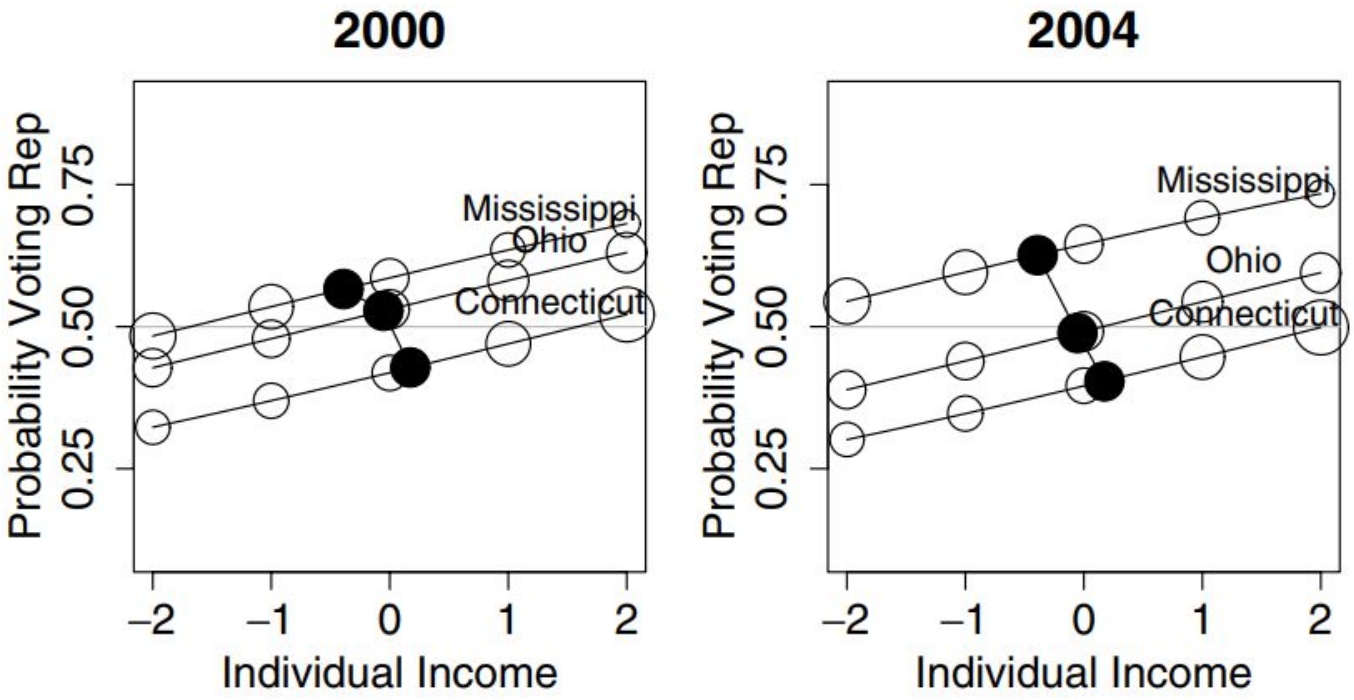
Observational studies

If we can’t experiment we can observe

Eliminate confounds- e.g. ice cream sales correlate with drowning

Simpson’s paradox

Red state, blue state, Andrew Gelman



Rules for interpreting causation

1. Size of effect is not implausibly large
2. Approximate spatial (temporal proximity)
3. Dose responsiveness and reversibility
4. Plausible mechanism of action
5. Effect fits with known facts
6. Replicated
7. Found in similar, non replication studies