Recitation, Week 3

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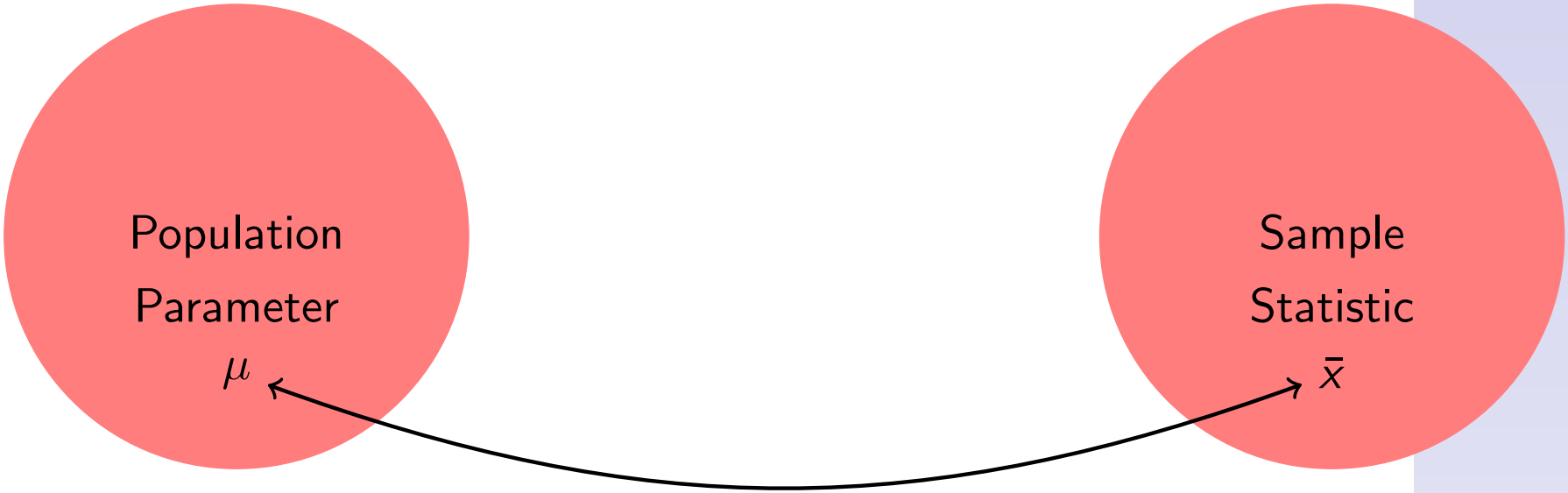
POL-850

Spring 2018

Outline

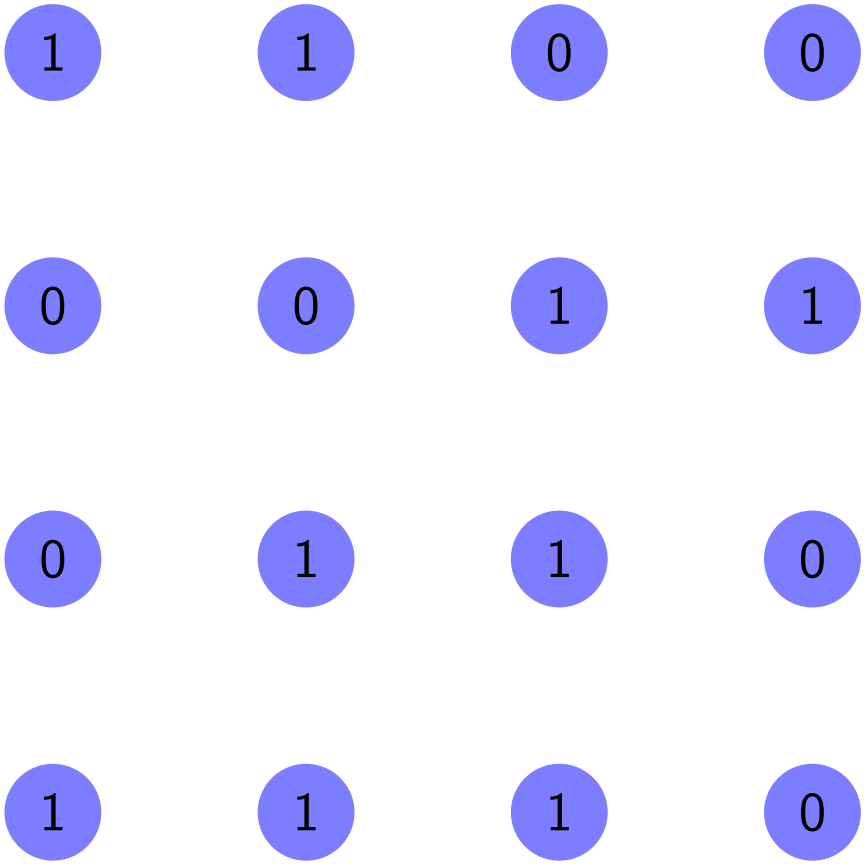
(1) Sampling
(2) Causality
(3) STATA session

What is sampling?



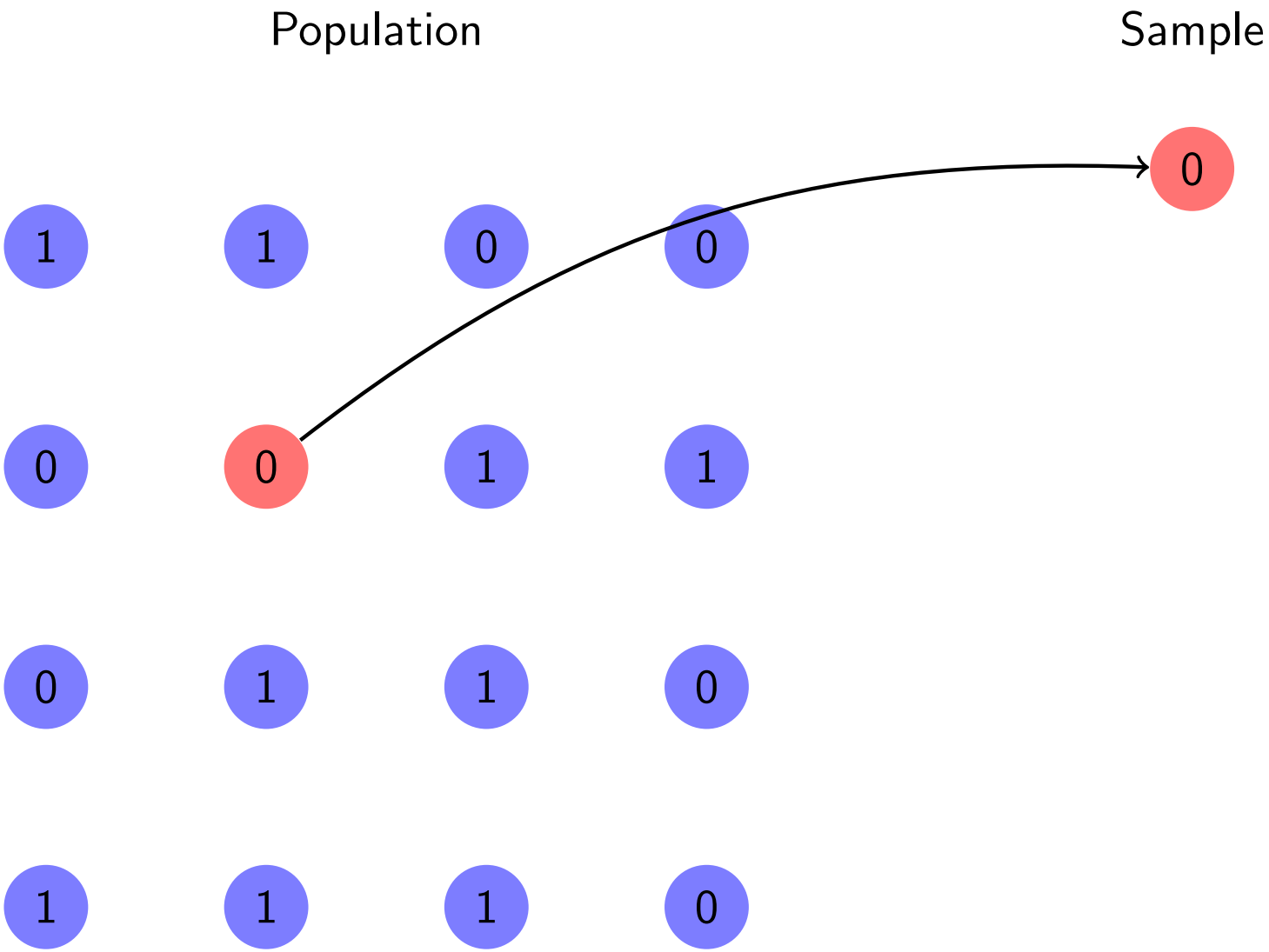
Random Sampling Error

Population



Sample

Random Sampling Error



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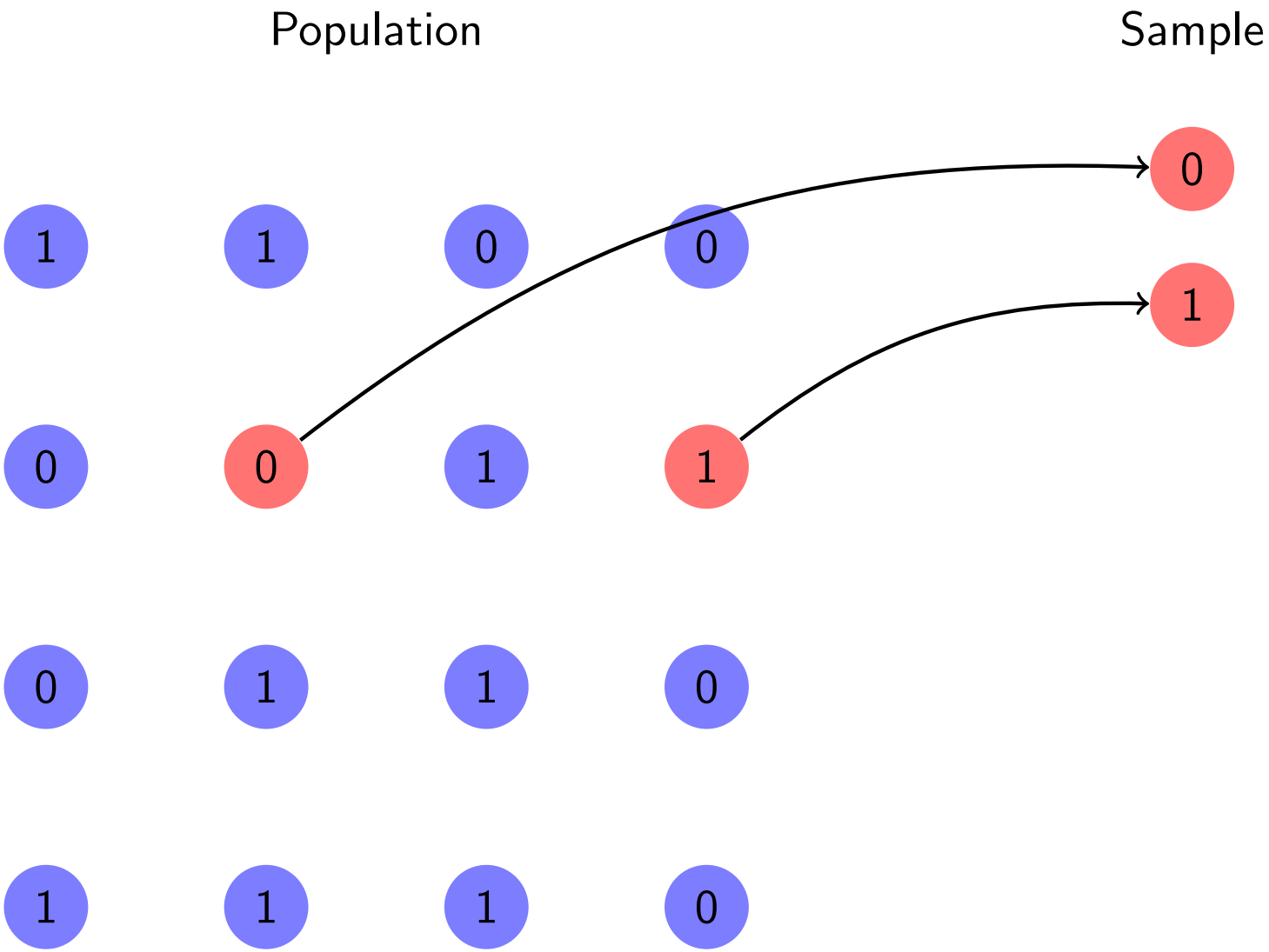

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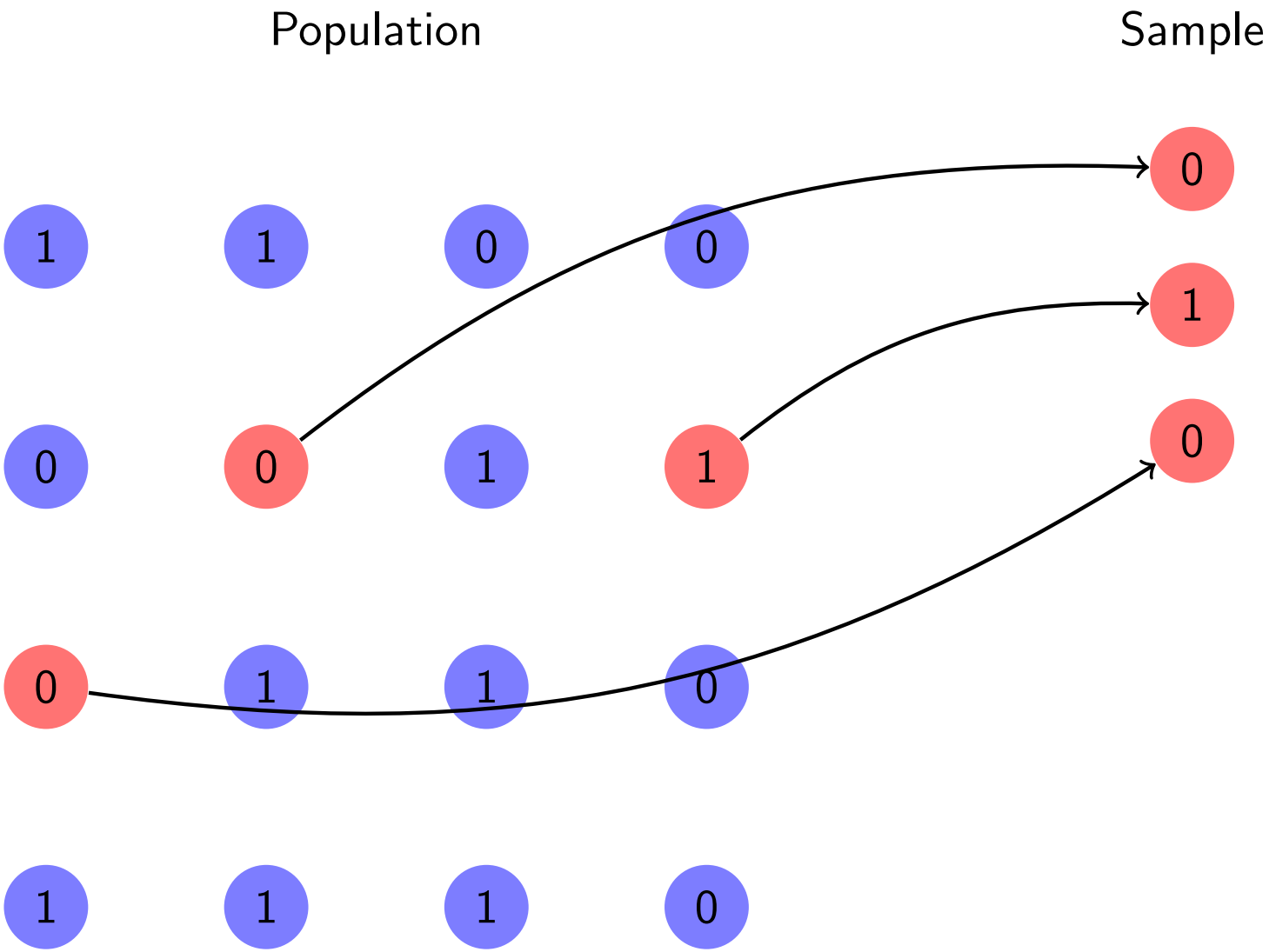

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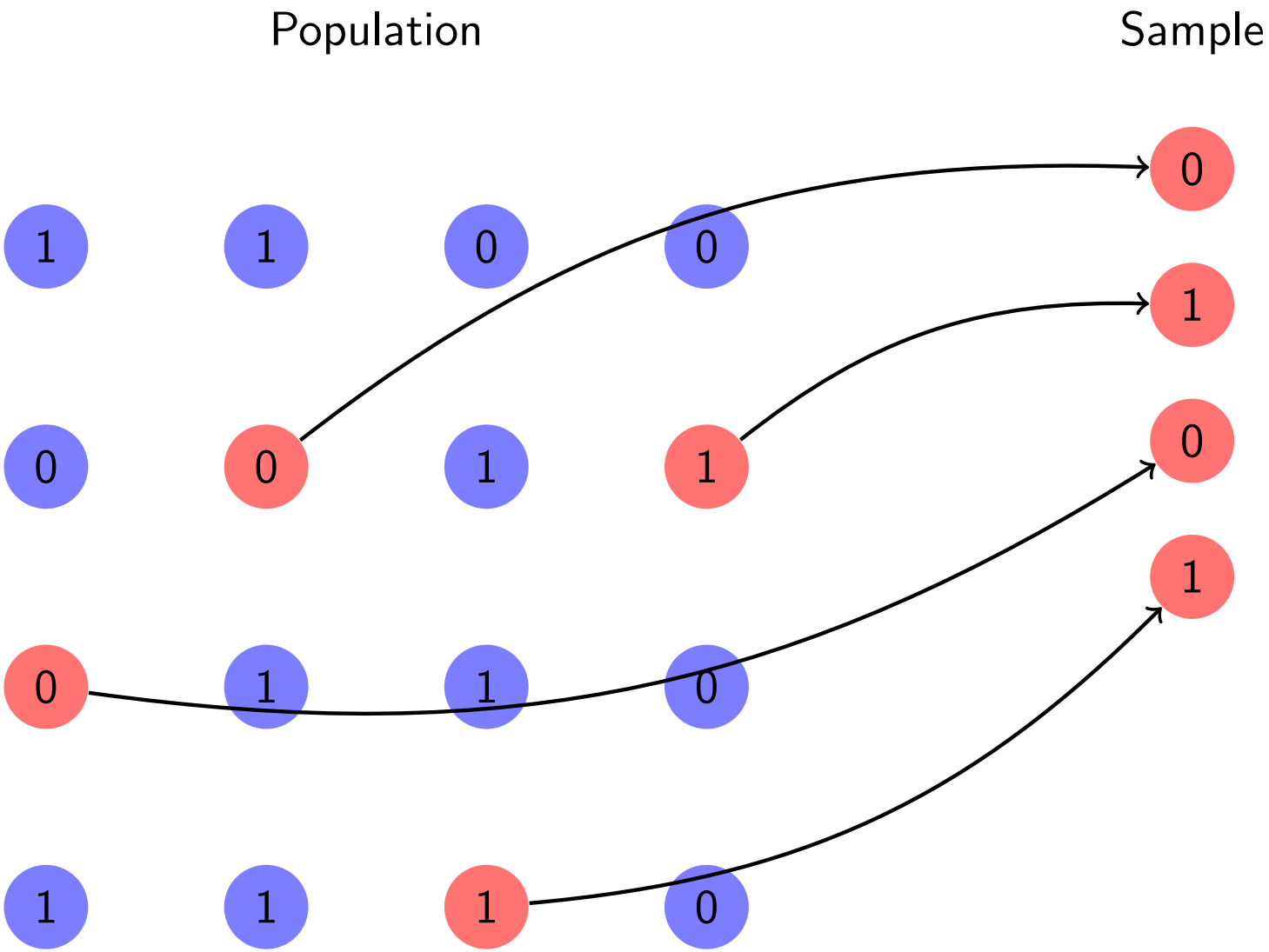

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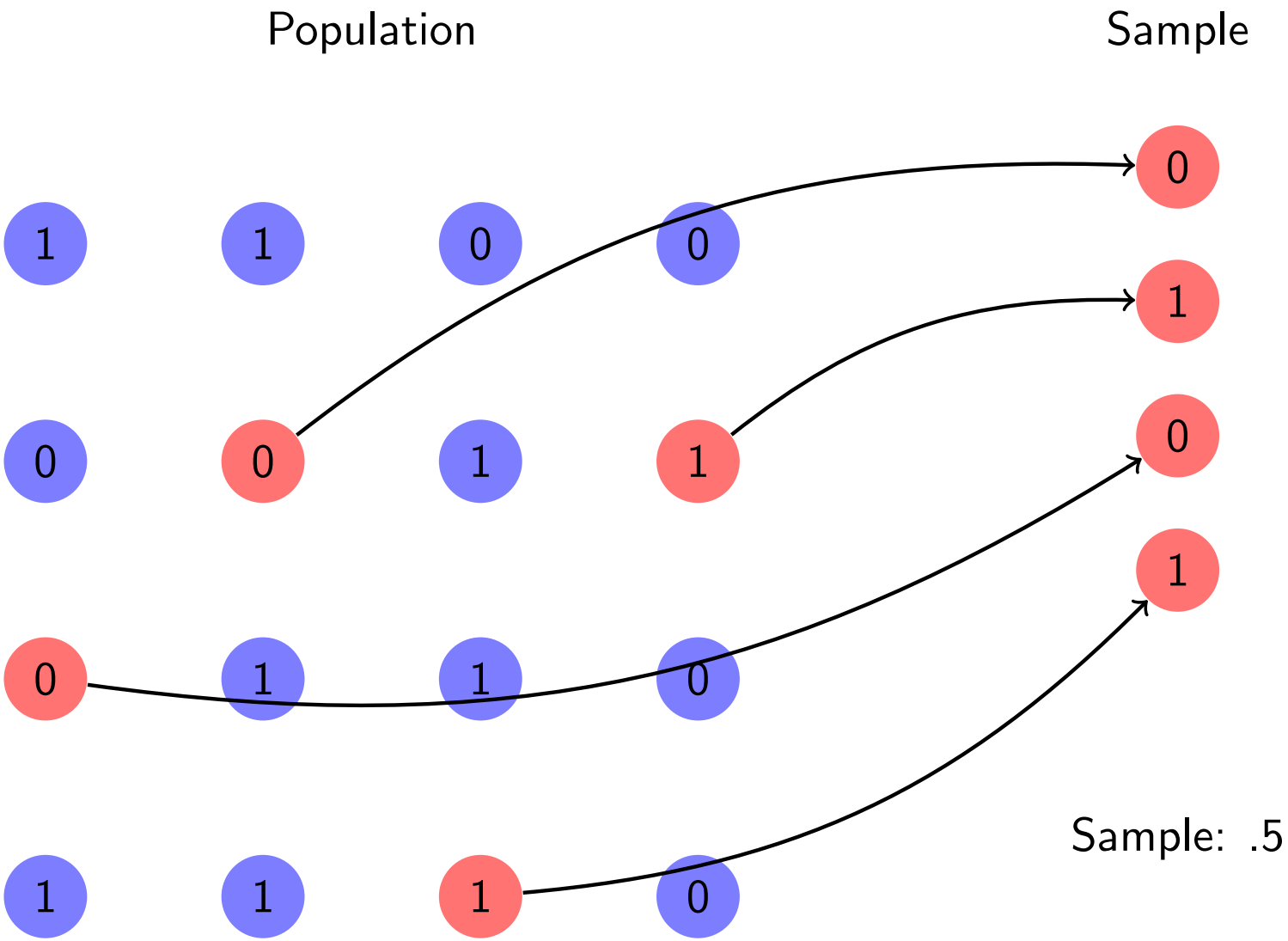

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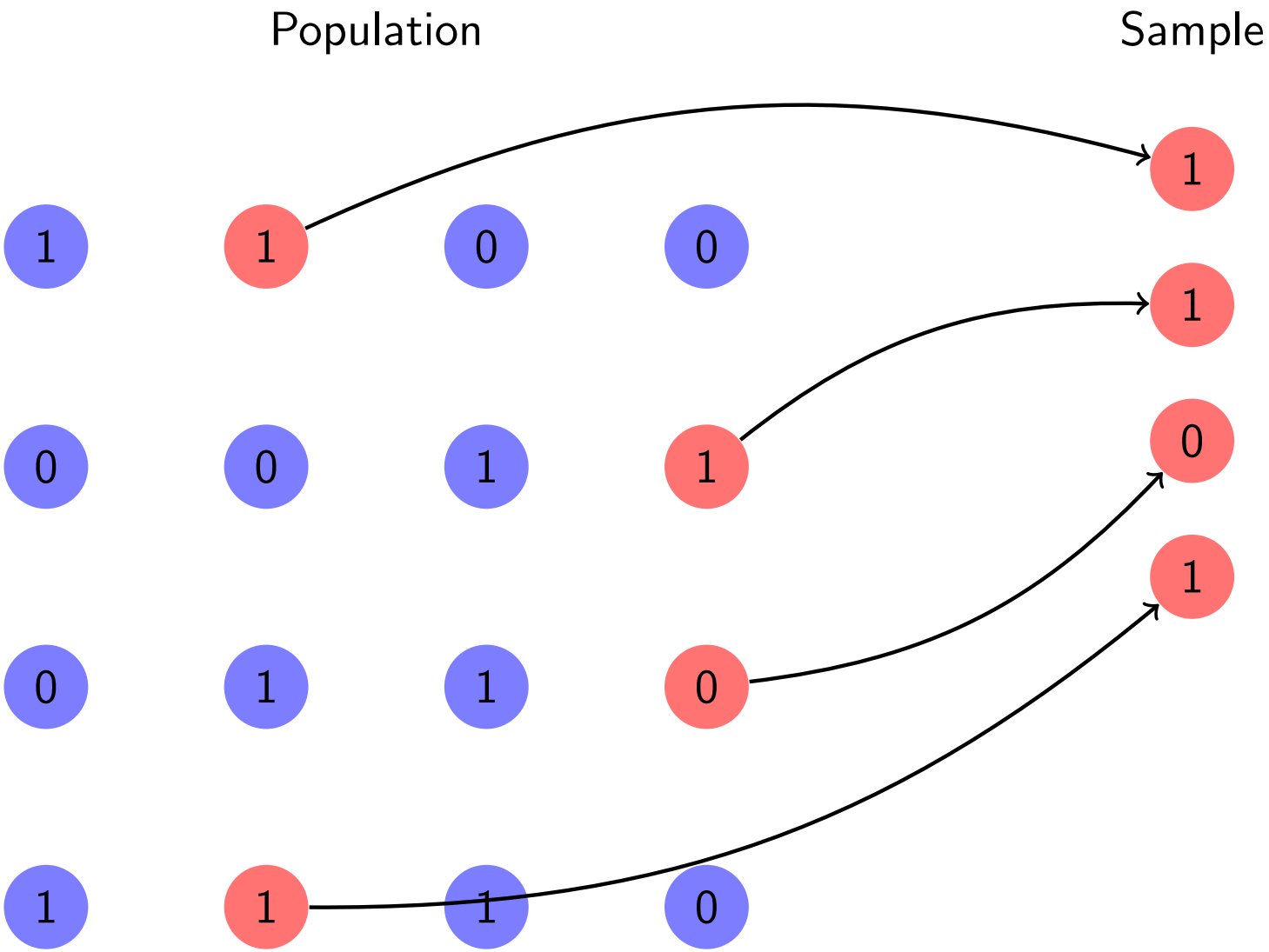

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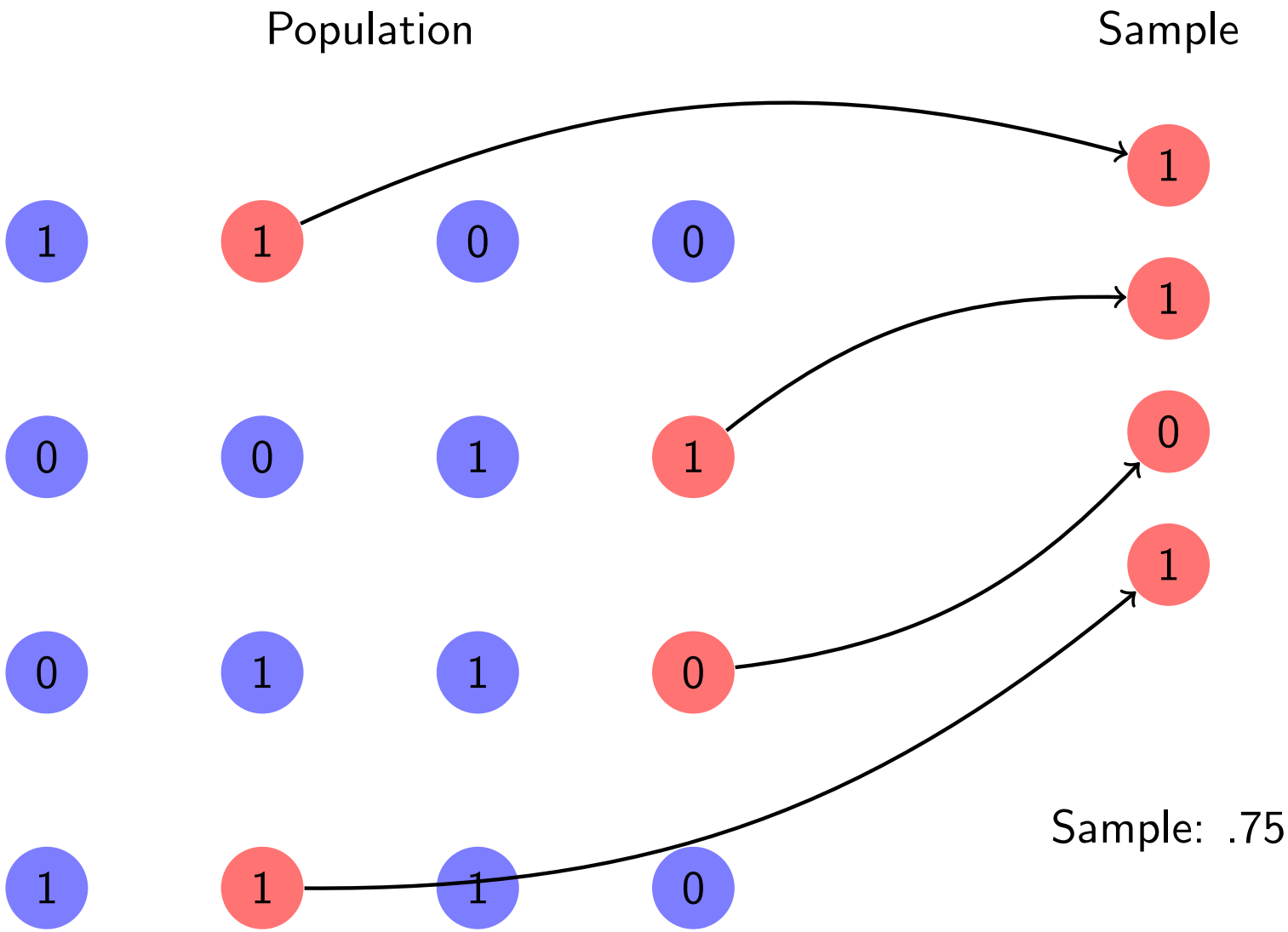

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- *As the sample size N goes to infinity, the sample average will converge to the population mean*
- One of the most power theorems in statistics (first proved by Jakob Bernoulli)

Random Sampling Error

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Population Parameter = Sample Statistic + Random Sampling Error

Random Sampling Error

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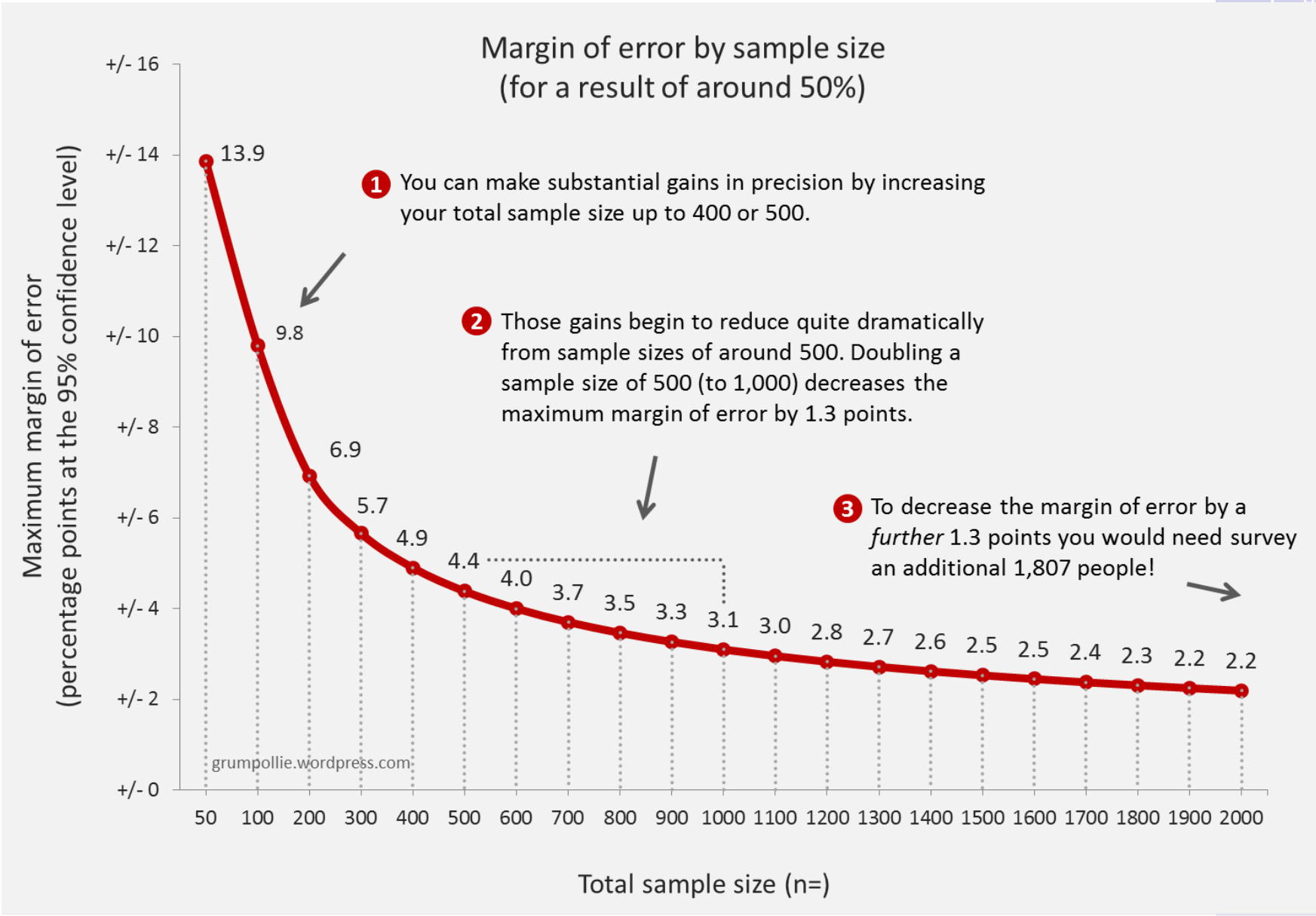
Sample Size Improvement $= \sqrt{n}$



Group Exercise

- Suppose an enterprising politics student filled up two bathtubs with 1,000 marbles each. In bathtub 1, she used 1 red marble and 999 blue marbles. In bathtub 2, she used 500 of each color. If she took a sample of 50 marbles from both bathtubs, which would have less random sampling error? Why?

500 red, 500 blue	1 red, 999 blue

Concepts you need to know

- Population
- Population parameter (true value; but unknown)
- Sample
- Sample statistic
- Estimate (statistical inference)

Problems in sampling

- Selection bias (sampling bias)

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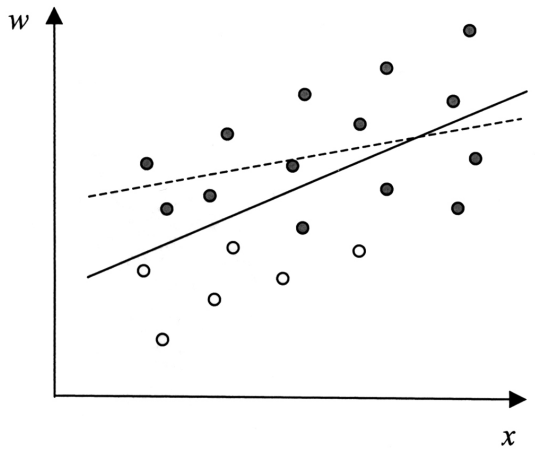

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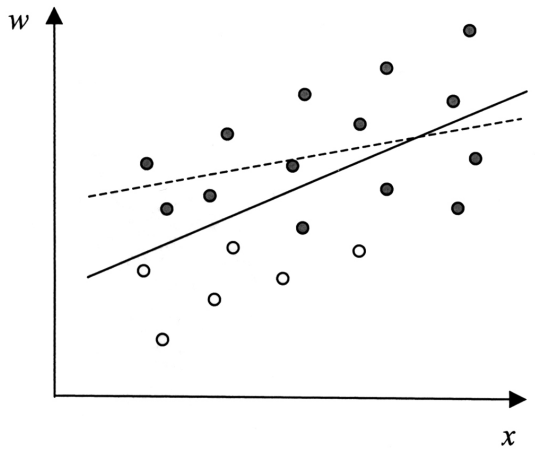

- Response bias
- Sampling frame

Sampling in the modern era

- Random sampling can still be expensive and not representative

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- Big Data: Why do we still need sampling?

CAUSALITY

Causality

Why do we care about it?

Causality

Why do we care about it?

- Social scientists care about causality
- Correlation (association) does not necessarily mean causation...
- But establishing causality is extremely difficult...

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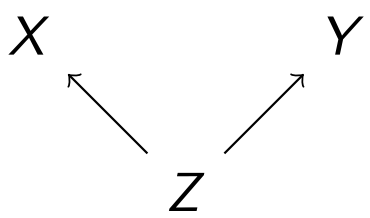

Z is a confounding variable.

Group exercise

Discuss what could be a confounder which causes a spurious relationship between X and Y

- Education level and wage
  (at individual level)
- Average temperature and GDP per capita
  (at country level)
- Campaign spending and electoral victory
  (at the congressional district level)

How to Identify Causality?

- Ideally, we need a time machine
- "The fundamental problem of causal inference" (Holland, 1986)
- We have to rely on assumptions
- Scientific solutions vs. Statistical solutions

Stata Exercise

- Find out the list of people who are older than Cate
- Find out the list of people whose income is greater than $10,000
- Find out the information about Jake (without using the browser)
- Find out the mean of income
- Find out the minimum value of age