

§1.1 Statistical and Critical Thinking

- Statistics
 - Context of Data
 - Source of Data
 - Sampling Method
- Voluntary Response - Bad
- Statistical vs. Practical Significance

§1.1 Statistics

① Collect Data

- Avoid Bias
- Kinds of Data

② Summarize and Present Data

Data Summary

$$\text{Proportion} = \hat{p} = \frac{X}{n} = \frac{\# \text{ of Successes}}{\# \text{ of Trials}}$$

$$\hat{p} = \frac{2}{33} = .06 \text{ or } 6\%$$

$$\text{Mean} = \bar{X} = \frac{\sum X}{n} = \frac{63 + 64 + 62}{3} = 63$$

Present - Graphs

Tables

Histogram

③ Center & Spread

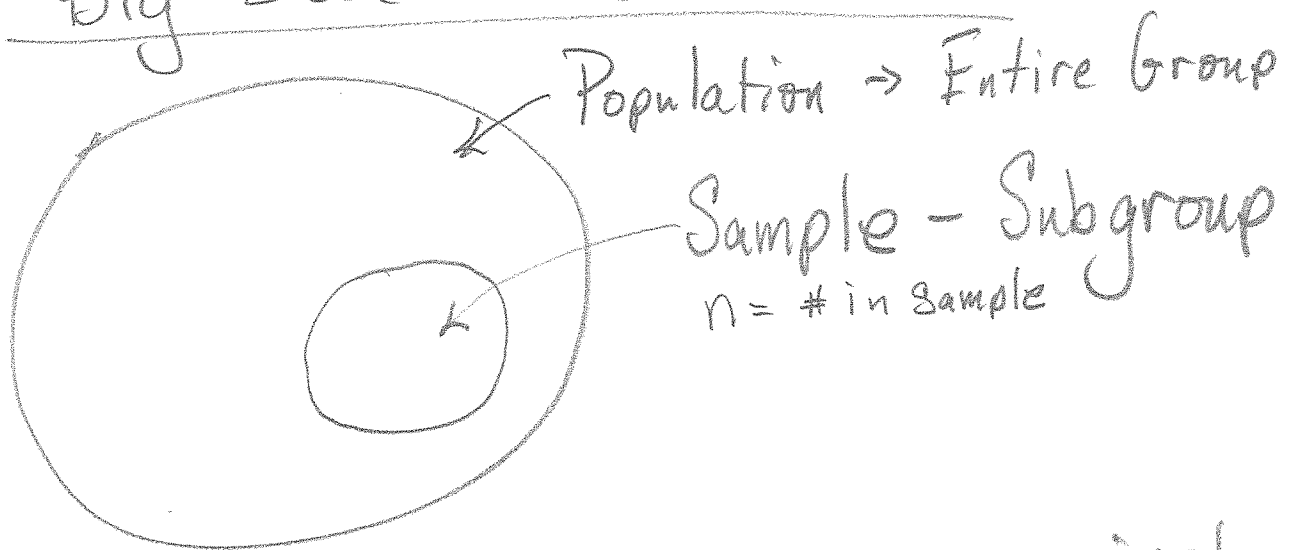
④ Probability

⑤ & ⑥ Distributions

⑦ → ⑫ Inferential Statistics

Use Data from a Sample to
Infer → Make a prediction
about the population as
a whole.

Big Idea of Statistics



A Sample Statistic is a numerical Summary base on a sample of size n .

$\hat{p} \rightarrow$ If data is categorical

$\bar{x} \rightarrow$ If data is quantitative

$\bar{x} = 63$

$\hat{p} = \frac{2}{38} = .06 = \text{lefties}$

A Population Parameter is a numerical Summary of the entire population.

$p = .10 \rightarrow$ General pop. 10% are lefties
 $=$ proportion of lefties in US population

$\mu - \text{mu} - \text{population mean}$

$\mu = 64 \text{ in}$

Big Idea in Statistics

Find Sample Statistic $\bar{x}$ or $\hat{p}$

Either

Predict Population Parameter μ or p

OR

The Sample is Statistically
Different from what we
expected or it's Not

Ex1 XSort is a Technique that is Suppose to increase the likely hood of having a boy.

Population = All people who will eventually choose to try XSort

Sample = 100 women in Trial.

a) If we get 90 boys out of 100.
Is method effective?

$$\hat{p} = \frac{90}{100} = \frac{x}{n} = .90 \text{ or } 90\% \text{ had boys}$$

This is statistically significant
because it would be very unusual to

See $\hat{p} = .90$ if $p = .5$.

The probabability of Sample is very Small
in any randomly Selected group of 100 births

Also practically significant

Increases likelyhood a Significant
Amount.

b) If 52 boys out of 100 births.

Since $\hat{p} = \frac{52}{100} = .52$ in 52 boys out of 100 births is ~~not~~ unlikely to occur in a random group of 100 births this is Not Statistically Significant

Also Not practically significant
won't pay to increase likelihood of by by 2%

c) If 5200 out of 10,000 births

Then $\hat{p} = \frac{5200}{10,000} = .52$

Later we'll be able to show that the Prop of getting 52% or higher is a sample of 10,000 births is only .00006337 when $p = .5$ or 50%
this is Statistically Significant

Collecting Data

Goal: Choose our Sample Subgroup from the Population so that it is representative of the entire population.

Best A Simple Random Sample

A sample in which each subgroup is equally likely to be chosen.

Ex

Population = SRJC Students

- Give each student an ID #

- A computer randomly selects $200 = n$
ID #s

Bias

Voluntary Response Sample ^{← Avoid}

Participants choose to be included

Ann Landers

Bad because only strong opinions
Reply.

Non Response bias → Random sample
of phone # is selected but too
many say No

Bad Sample Frame

Group selected systematically
underrepresent some segment of population

Self Interest Study

Sampling Methods that introduce Bias

Voluntary Response Sample

People in Sample choose to participate

- Internet Survey
- Phone-in Response to Radio host
- Write-in Response

Only people with strong opinions Reply

"Would you have kids again?" No 70%
of write ins

A SRS gave 95% would have kids again

Non Response Bias

A SRS is taken but a large proportion of those asked decline to answer question.

③ Loaded Question

④ Biased Interviewer

⑤ { Self-interest Study
 { Biased Source

chocolate company sponsors
study to show chocolate helps you
think better.

⑥ Bad Frame

Group Survey doesn't Represent population

Dewey vs. FDR