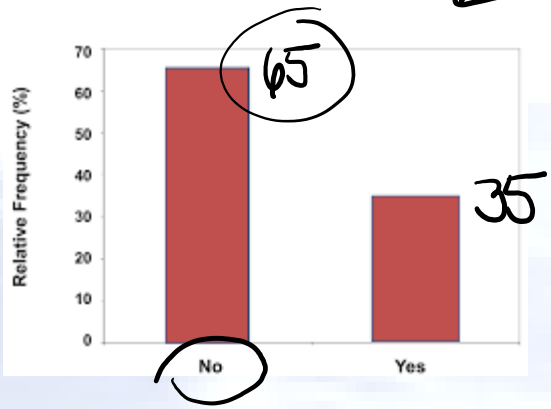
V23 - Estimation – Part 6

- Binary data
  - Mode
- Proportion
  - Parameter
  - Point estimate
- Bernoulli trial
- Binomial random variable
  - Approximation to Binomial Distribution

Course: Statistical Testing & Regression
Dr. Renee Clark
Swanson School of Engineering
Industrial Engineering
University of Pittsburgh

Binary Data

- Qualitative or categorical data
  - Binary variable has only 1 of 2 possible categories or values
    - Part defective or not defective
    - COVID test positive or negative
    - Offer extended or not extended to candidate
  - aka Dichotomous



"No" is mode or modal category.

Descriptive Statistic for categorical data.

- Polytomous
  - More than two categories

Proportion and Bernoulli Trial

- Population proportion (parameter) is labeled as p
  - Proportion of all cars in Pittsburgh that are blue
  - Proportion of all items made at a factory are defective

- Estimate of p comes from Bernoulli trials (n of them)

- **Bernoulli trial:** experiment that can be classified 1 of 2 ways (e.g., yes or no; success or failure; defective or not defective); it's a binary variable

- Estimate (point estimator) of p: $\hat{p} = \frac{Y}{n}$ "hat" (estimate)

Point Estimate for Proportion

$$\hat{p} = \frac{Y}{n}$$

Count of "successes" in *n* trials ("success" is characteristic you're counting)

trials (sample size)

Bernoulli

Bernoulli

"success"

Y is a **binomial random variable.** It is **sum of (0/1) outcomes** from *n* Bernoulli trials

NORMAL distribution approximates binomial distribution if

1. $np \geq 5$ and $n(1-p) \geq 5$

Acknowledgement

This material is based upon work partially supported by the National Science Foundation under Grant# 2335802. Any opinions, findings, and conclusions, or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

You are free

- to **Share** – to copy, distribute, display and perform the work
- to **Remix** – to make derivative works

Under the following conditions

- **Attribution** — You must attribute the work in the manner specified by the author or licensor (but not in any way that suggests that they endorse you or your use of the work).
- **Noncommercial** — You may not use this work for commercial purposes.
- **Share Alike** — If you alter, transform, or build upon this work, you may distribute the resulting work only under the same or similar license to this one.

THE END