1. Suppose we want to estimate the mean weight gain among a cohort of college freshmen. We randomly sample 324 freshmen and follow them over the entirety of their first year. Unknown to us, in the entire cohort, the mean weight gain over the year is 20 pounds and the standard deviation is 9 pounds. What is the expected value and the standard error of the sample mean?

$$\mathbf{E}(\bar{X}_n) = \mu = 20$$

Expected value of a statistic is the true population parameter.

$$\mathbf{SE} = \frac{\sigma}{\sqrt{n}} = 0.5$$

For use in confidence intervals:

$$\mathbf{ME} = z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$$

2. Suppose we want to estimate the prevalence of cardiovascular disease among older adults residing in Nairobi. Unknown to us, the prevalence is 20%. We take a random sample of 400 older adults.

2.1 What is the standard deviation in the population? Express your answer in percentage points.

p=0.2
n=400

If we know p=0.2, do we have a standard deviation? Do we have (in other words) uncertainty?

The sample proportion is a sample mean.

0
1
0
1
1
1
1
1
0

# of 1's over total = 6/9

sample mean = (1+1+1+…+1)/9

E(sample mean) = true mean

2.2 What is the expected value and the standard error of the sample mean? Express your answers in percentage points.

What is the expected value for the sample proportion?
What is the standard error of the sample proportion?

$$\mathbf{E}(\hat{p}) = p = 0.2$$

$$\mathbf{E}(s^2) = \sqrt{\frac{p(1-p)}{n}} = 0.02$$

This is the standard deviation of a sampling distribution which is called "standard error".

***Look at chapter 13 on sampling distributions… See sampling distribution of p-hat.**

true mean

3. Fill in the blanks:

As n increases the estimate $\bar{x}$ gets closer to the μ true population parameter

The sample mean is an unbiased estimator (2 word answer) of the population mean

4. Read the article from the New York times on margins of error in polling

https://www.nytimes.com/2016/10/06/upshot/when-you-hear-the-margin-of-error-is-plus-or-minus-3-percent-think-7-instead
html

Name 2 sources of error mentioned in the article other than the error related to sampling variability.

nonsampling error

1. Error in analysis.
Explain.

analysis error - our pollsters arrived at different estimates

2. Nonsampling error.
Explain.

(non)response bias

influential language / poorly phrased questions

selection bias