

# POLI 502 FA20: Homework 4

## Due at 6PM on Wednesday, October 28, 2020

**Directions.** Answer each question completely. Submit complete replication files so I can change your `setwd()` code and then reproduce all your output. Also include the completed assignment as a  $\LaTeX$ -typeset .pdf file.

### Exercise 1

For this exercise, use the WDI data we downloaded during our Chapter 5 R tutorial in class. As in class, we will assume that each variable represents a population, ignoring repeated measurement over time, etc.

**A.** First, set your random seed equal to the month and day of your birthday (mine would be 119, for January 19). Then, using a `for()` loop, take 100 samples, each of 70 observations, for the **tetanus vaccination** variable, storing as vectors all sample properties needed to calculate **99% confidence intervals** for each sample.

**Hint: Note that in class we stored 95% confidence bounds directly. You could do something similar for these 99% bounds. Alternately, you could save the sample mean and standard error, and then calculate the intervals after the loop completes. Or, you could save the sample mean, sample standard deviation, and sample size (which could vary due to missingness)...**

**B.** Graph each sample mean with 99% confidence intervals using the `ggplot2` package (similar to what we did in class). Also graph a line indicating the population mean. Remember to include proper labels.

**C.** How many confidence intervals appear not to overlap the population mean? How does this finding relate to what we would expect to see on average given the Central Limit Theorem? Explain.

**D.** Repeat parts A and B, this time using a sample size of 10 rather than 70. How do results differ (or do they)?

### Exercise 2

Explain the joke in the xkcd comic that follows on the next page (credit to Randall Munroe). You can get a bonus point if you calculate the following: 1) the probability of this outcome (one significant result in 20 trials); 2) the probability of at least one significant result in 20 trials

### From the text

*Note: Do all math in R and submit the (annotated) code. Show all your work!*

Diez et al. Chapter 5 Exercises: 5.16, 5.22.

