Jessica Bonin
Analysis of Environmental Data
Week 7 Reading Questions
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Worked with no one

Q1: Explain the effect, if any, of the population mean on the width of CIs for a population that is normally distributed. If population mean does not affect the widths of CIs explain why not.

> Confidence intervals are calculated from standard errors. The standard error is the sample standard deviation adjusted for sample size. The population mean does not affect the standard error and, therefore, does not affect the width of the CI.

Q2: Explain the effect, if any, of the population standard deviation on the width of CIs. If population standard deviation does not affect the widths of CIs explain why not.

> As the sample size increases, the standard deviation of the sampling distribution decreases. This also decreases the width of the CI.

Q3: Explain the effect, if any, of the population size on the width of CIs. If population size does not affect the widths of CIs explain why not.

> Confidence intervals are calculated from standard errors. The standard error is the sample standard deviation adjusted for sample size. The population size does not affect the standard error and, therefore, does not affect the width of the CI.

Q4: Explain the effect, if any, of the sample size on the width of CIs. If sample size does not affect the widths of CIs explain why not.

> An increase in sample size will decrease the width of the CI. The closer you have to 30 or more samples, the closer the distribution will be normal (Central Limit Theorem). As the number of samples increase, the Cis get narrower.

Q5: Interpreting a CI. Use a narrative example of a real (or made up) dataset to describe what a Frequentist 95% confidence interval really means.

> The reason why we use frequentist statistics is because we assume that our population is so large that it is impossible to know anything about it. We can use frequentist statistics to help us build a model to help us infer information about the true population. The inference about the true population is based on this model. The idea is that, if we could hypothetically sample the population an infinite number of times, that the results will be very close to the true population parameters.
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> For example, suppose I want to find the average weight for every grain of sand on earth. I definitely cannot weigh every grain myself, that's impossible! It's even

impossible to know how many grains of sand actually exists. The frequentist model will help us simulate the results if I could spend my life sampling sand. If I could repeat sampling sand a crazy number of times, I expect that the true mean weight of grains of sand would fall within my 95% confidence intervals approximately 95% of the time.