

WEEK 7: Reading Questions

- **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.

Changing the population mean does not change the width of the confidence intervals for a population that is normally-distributed. This is because in the frequentist paradigm we assume that it is unknowable.

- **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.

Changing the population standard deviation does have an effect on the width of the confidence intervals. With changing the population standard deviation you change the confidence either narrowing it or widening it.

- **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.

The effect of the population size on the width of confidence intervals is that the larger the population size the wider the width of the confidence intervals. If your sample size is not changing with your population size, then you are making it less likely that within each event you will be getting the population mean. If I am surveying butterflies to get the average forewing measurement and believe the population is isolated to only one mountain top, then I'm going to collect the number of samples appropriate for such a small population. While out hiking I find a same species on three other mountain tops nearby discovering the population is much larger than once thought. If I do not increase my sample size, I have a lot more error within my confidence intervals.

- **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.

A larger sample size can decrease the error in the estimate stabilizing the population standard deviation.

- **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.
 - Make sure you cover any relevant assumptions of the Frequentist paradigm.
 - Your answer must be in non-technical language.
 - Imagine you were explaining confidence intervals to an audience of teenagers, or perhaps a family member who doesn't have training in statistics.

I am working with an endangered butterfly in Concord, NH known as the Karner Blue butterfly. New Hampshire Fish and Game has been working with this isolated population for 20+ years and

helping to supplement the wild population with captive reared individuals. Over the past few summers biologists in the captive rearing lab have begun to notice the size of the butterflies shrinking. In order to determine if the butterflies from recent captive reared populations are smaller than the wild population, biologists have to collect a sample of the wild population and measure their wings. Because the true number of the captive reared population is known, and biologists have the ability to measure every individual we are able to get a true mean. With the wild population biologists are working with an estimated population size from population surveys conducted each year and determine a sample size. Once the survey is complete we can create a confidence interval and assume that if we were to capture a wild Karner Blue that it's wing size would fall into the wing size range 95% of the time.