**R Lesson 9 - Statistical Inference Hypothesis Testing for Single Populations**

**References:**  
Black Chapter 9 Statistical Inference: Estimation for Single Populations (pp. 298-351)  
Verzani Chapter 9 Significance Tests (pp. 294-312)  
Stowell Chapter 10 Hypothesis Testing (pp. 144-146, 158)

**Exercises:** Use R to answer the following questions

1. Assume a random sample of size 100 is drawn from a normal distribution for which the mean and variance are unknown. Assume the sample mean is 50 and the standard deviation of the sample is 2. Test the hypothesis that the true mean is 56, and also test the hypothesis the true mean is 40. Report p-values and comment on the results.

**Data Set:** [hot\_dogs.csvView in a new window](https://canvas.northwestern.edu/courses/38799/files/2178785/download?wrap=1)

**Variable Names:**

1. Type = Type of hotdog (beef, meat, or poultry)
2. Calories = Calories per hot dog
3. Sodium = Milligrams of sodium per hot dog
4. Use [hot\_dogs.csvView in a new window](https://canvas.northwestern.edu/courses/38799/files/2178785/download?wrap=1) data and hypothesis tests to determine which type of hot dog has average calories less than 140 with 95% confidence. Present boxplots of calories by type of hot dog.
5. Using [hot\_dogs.csvView in a new window](https://canvas.northwestern.edu/courses/38799/files/2178785/download?wrap=1) data and hypothesis tests at the 95% confidence level, determine which type of hot dog has an average Sodium level different from 425 milligrams.
6. Using [hot\_dogs.csvView in a new window](https://canvas.northwestern.edu/courses/38799/files/2178785/download?wrap=1) data and hypothesis tests, determine if the variance in Sodium values for beef hot dogs is different from 6000 with 95% confidence.
7. A coin is flipped 100 times. If it is unbiased the probability of a heads should equal the probability of a tails. At the 95% confidence level, test the null hypothesis the coin is unbiased versus the alternative that it is biased if 43 heads are obtained. Test the same hypothesis if 63 heads are obtained. Use one-sided hypothesis tests.
8. [salaries.csvView in a new window](https://canvas.northwestern.edu/courses/38799/files/2178772/download?wrap=1) contains data derived from a November 8, 1993 article in Forbes titled “America’s Best Small Companies”. The file gives the CEO age and salary for 60 small business firms. Use these data to test the hypothesis at 95% confidence that at least 50% of the CEOs are 45 years old or older. Also test the hypothesis at 95% confidence that at least 50% of the CEOs earn less than $500,000 per year. Use one-sided hypothesis tests.

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* [Lesson\_09\_Solutions.pdfView in a new window](https://canvas.northwestern.edu/courses/38799/files/2178728/download?wrap=1)
* [Lesson\_09\_Code\_Solution.rView in a new window](https://canvas.northwestern.edu/courses/38799/files/2178716/download?wrap=1)