

MONT 105N – Analyzing Environmental Data
Practice Problems on Hypothesis Testing
April 8, 2019

Directions

We'll make two “passes” on these problems.

- In the first, we just want to identify what kind of test we will need (is it a test for a mean, or a proportion? large or small sample case?), and identify appropriate null and alternative hypotheses from the question that is asked.
- Then, in the second pass, we'll learn how to compute a test statistic, set up a rejection region, and decide whether we have enough evidence to reject the null hypothesis

Questions

1. CO_2 emissions per Megawatt-hour (Mwh) of electric power produced were measured for $n = 100$ coal-fired power plants. Assume this was a random sample of all such power plants in the U.S. (there is a population of several thousand such power plants). The sample average CO_2 emissions per Megawatt-hour is $\bar{Y} = 2223.1$ lb/Mwh, with sample $SD = 211.3$ lb/Mwh. Is there evidence to say that the population average coal-fired power plant has CO_2 emissions per Mwh greater than 2100 lb/Mwh? Test with $\alpha = .01$.
2. In a telephone survey of 900 randomly selected adults in December 2018, 558 said that they did not believe President Trump was being completely honest about contacts between his Presidential campaign in 2016 and Russians. Is there evidence to say that fewer than 65% of the adult residents of the U.S. thought the same thing at that point in time? Test with $\alpha = .05$.
3. In a study of $n = 17$ sea star arm lengths, the average was $\bar{Y} = 6.8$ cm with an $SD = .5$ cm. Is there evidence to say that the population arm length is different from 7 cm? Test with $\alpha = .05$.
4. A medical study compared the resting pulse rates of random, independent samples of 100 smokers and 100 nonsmokers. The smokers had an average pulse rate of $\bar{Y} = 86$ beats per minute with $SD_1 = 5.4$, while the nonsmokers had an average pulse rate of $\bar{X} = 80$ and $SD_2 = 4.9$. Is there evidence to say that nonsmokers have a lower average pulse rate? Test with $\alpha = .05$
5. The data used in question 1 above actually comes from the 100 largest coal-fired electric power plants in the U.S. (this is true) at one point in the early 2000's. Is this a random sample? Does the question and the calculation you did in question 4 really make sense in this setting? Discuss.