STAT 2507

Tutorial 4

Contact Information

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Section A3: Mondays 4:35-5:25

Section C2: Tuesdays 2:35-3:25

Section A5: Thursdays 12:35-1:25

Section A8: Thursdays 1:35-2:25

Today's Tutorial

- Common mistakes from T2: I'll email you once I know! (Same with A4)
- Quick review: CLT and Difference of Means HT
- Using SPSS to compare sampling distribution of means, and perform a difference of means hypothesis test

Review: CLT

The sampling distribution of the mean of a simple random sample of size n from <u>any population</u> with mean μ and variance σ^2 is approximately normal when n is "large enough" (at least 30).

That is, $\bar{X}$ is approximately normal with mean μ and variance σ^2/n .

$$\bar{X} \overset{\text{approx}}{\sim} N(\mu, \sigma^2/n).$$

Review (maybe?): Difference of Means HT

- We want to test if there is a difference in the average cholesterol level drop between two groups. The first group took “Drug A”, and the second group took “Drug B”
  - This is a hypothesis test for a **difference in means**
- Our null hypothesis is that the means for the two groups are equal. Our alternative hypothesis is that they are not equal / they are different.

$$H_0 : \mu_1 = \mu_2$$
$$H_A : \mu_1 \neq \mu_2$$

Two-Tailed Test

$$H_0 : \mu_1 - \mu_2 = 0$$
$$H_A : \mu_1 - \mu_2 \neq 0$$

Review (maybe?): Difference of Means HT

- First, we need to check if the variances are equal
  - This is called the “Levene’s Test for Equality of Variances”
- If the p-value > alpha = 0.05, we fail to reject the null hypothesis and we conclude that the variances ARE the same. Otherwise, conclude that there is statistically significant evidence that the variances are different.
  - Ours is 0.407
- Rule of thumb from class: If the ratio of the sample variances is between ⅓ and 3, you’re good to go.

$$H_0 : \sigma_1^2 = \sigma_2^2$$
$$H_A : \sigma_1^2 \neq \sigma_2^2$$

Std. Deviation
1.79097
1.47358

Review (maybe?): Difference of Means HT

- Now that we know the variances are the same for the two groups, we proceed with our test
- If the p-value > alpha = 0.05, we fail to reject the null hypothesis and conclude that the means of the two groups ARE the same
    - Ours is 0.00

Review (maybe?): Difference of Means HT

- What if we instead wanted to know if the average cholesterol level drop for Drug A was higher than Drug B?
- Just divide our p-value by 2
  - 0.00 / 2 = still 0.00
- Note: we can't always just "divide by 2". We can do this ONLY because we see that the sample mean for Drug A is higher than the sample mean for Drug B.

One-Tailed Test

Mean
6.0385
2.6714

$$H_0 : \mu_1 = \mu_2$$
$$H_A : \mu_1 > \mu_2$$

$$H_0 : \mu_1 - \mu_2 = 0$$
$$H_A : \mu_1 - \mu_2 > 0$$