Lab 5 – Siblings

When pairs of sisters reach adulthood, is there a difference in mean height between the older sisters and the younger sisters? Twelve families were randomly selected with exactly two daughters: an older sister and a younger sister. Every sister's height was measured on their 25th birthday. The data is in a file named sisters.csv.

older	younger
64.6	62.6
68.7	66.3
65.7	66.9
69.6	70.2
64.7	64.4
64.2	62.6
65.7	65.2
68.8	69.6
66.1	67.8
65.7	63.9
67.1	67.2
65.5	64.5

R

Is there significant evidence that older sisters have a different height (on average) than younger sisters on their 25th birthdays?

Null and Alternative Hypothesis:

Draw the Rejection Region (if $\alpha = .05$):

Read in the data set and create a new variable named **diff** which equals (height of the older sister in inches at age 25) – (height of the younger sister in inches at age 25). Find the sample mean and sample standard deviation among the differences, then compute the test statistic by hand. Round off to the second decimal place.

Conclusion:

Place bounds on the p-value (draw picture):

Use the R function **`t.test`** to confirm the value of your test statistic and to find the exact p-value (see the R6 handout). What is the exact p-value? Round off to the third decimal place.

It is necessary to assume the data is normally distributed? Why or why not? If your answer is yes, look at the QQ plot and report whether or not a normality assumption is reasonable.

SAS

A social scientist named Wendy is studying middle school children and how much time they spend looking at screens (television, computers, video games, smart phones, etc.). Wendy wants to know if children with zero siblings (often referred to as "only" children) have more weekly screen time than children who have at least one sibling. She took independent random samples of sizes $n_1 = 31$ and $n_2 = 61$ from the two populations and recorded the hours of screen time a child has during a typical week. The data is in a file named screentime.csv.

minutes	only
568	yes
479	yes
791	yes
881	yes
1026	yes
599	yes
857	yes
826	yes

Find sample means and variances for the two samples:

	only = yes	**only = no**
sample size	31	61
sample mean		
sample variance		

On the next page you will test H_0: $\sigma_1^2 = \sigma_2^2$. (see SAS6 handout)

If H_0: $\sigma_1^2 = \sigma_2^2$ is <u>rejected</u>, then you should <u>not</u> assume $\sigma_1^2 = \sigma_2^2$ when conducting the two-sample hypothesis test for $\mu_1 - \mu_2$. In other words, you should use the Case 1 (Satterthwaite) method.

If H_0: $\sigma_1^2 = \sigma_2^2$ is <u>not rejected</u>, then assume $\sigma_1^2 = \sigma_2^2$ when conducting the two-sample hypothesis test for $\mu_1 - \mu_2$. In other words, you should use the Case 2 method where you assume $\sigma_1^2 = \sigma_2^2 = \sigma_p^2$ and estimate σ_p^2 with s_p^2

Null and Alternative Hypothesis:

Draw Rejection Region (if $\alpha = .05$)

Compute the test statistic by hand. Round off to the second decimal place.

Conclusion:

Now use the SAS proc named **`ttest`** to confirm the value of your test statistic and to find the exact p-value (see the SAS6 handout). What is the exact p-value? (**Don't forget**: SAS assumes a two-sided test. Since you are doing a one-sided test, divide the SAS p-value by two.) Round off to the third decimal place.

Which two-sample hypothesis test is appropriate? Circle one answer and then complete the test on the next page:

Case 1 (Satterthwaite): we do not assume $\sigma_1^2 = \sigma_2^2$

Case 2: we assume $\sigma_1^2 = \sigma_2^2 = \sigma_p^2$ and estimate σ_p^2 with s_p^2

Null and Alternative Hypothesis:

Draw Rejection Region (if $\alpha = .05$)

Compute the test statistic by hand. Round off to the second decimal place.

Conclusion:

Place bounds on the p-value (draw picture):

Now use the SAS proc named **`ttest`** to confirm the value of your test statistic and to find the exact p-value (see the SAS6 handout). What is the exact p-value? Round off to the third decimal place.

After you have completed this handout, complete the Canvas quiz titled:
Lab 05 – Siblings