

Due Monday, March 31

These homework questions should be done by hand. You can use R or Excel to calculate means & standard deviations, but I want you to calculate the t-statistics by hand

1. Does bread lose its vitamins when stored? Small loaves of bread were prepared with flour that was fortified with a fixed amount of vitamins. After baking, the vitamin C content of two loaves was measured. Another two loaves were baked at the same time, stored for three days, and then the vitamin C content was measured. The units are milligrams per hundred grams of flour (mg/100g). Here are the data:

Immediately after baking:	47.62,	49.79
Three days after baking:	21.25,	22.34

- When the bread is stored, does it lose its vitamin C? To answer this question, perform a two-sample t-test for these data. Be sure to state your hypotheses, the test statistic with degrees of freedom, the p-value, and the conclusion in terms of the problem.
2. Suppose that the researchers in the previous exercise could have measured the same two loaves of bread immediately after baking and again after three days. Assume that the data given had come from this study design. (Assume that the values given in the previous exercise are for first loaf and second loaf from left to right).
 - Explain carefully why your analysis in the previous exercise is not correct now, even though the data are the same.
 - Redo the analysis for the design based on measuring the same loaves twice.
 3. Refer to the exercise 1. The amount of vitamin E (in mg/100g of flour) in the same loaves was also measured. Here are the data:

Immediately after baking:	94.6,	96.0
Three days after baking:	97.4,	94.3

- When the bread is stored, does it lose vitamin E? To answer the question, perform a two-sample t-test for these data. Be sure to state your hypotheses, the test statistic with degrees of freedom, the p-value, and the conclusion in terms of the problem.
4. Using your SMD data, for one gene and one comparison, I want you to do a t-test by hand. You can use Excel or R to calculate means and standard deviations, but I want you to create the actual t-statistic by hand. Show that you get very similar (it won't be exactly the same) results to what you got from limma.