**10 Takeaways**

1. We typically deal with one sample that results, out of a ton of possible samples that may have resulted

2. We use sample statistics, calculated from sample data, to make statements about population parameters whose true values we will likely never know (statistical inference)

3. Specifically, we use sample data to test how likely it is that our sample came from a population with pre-specified population parameters

4. We need to use appropriate statistics for hypothesis tests

- **Scenario:** A friend was reading a paper that says that the mean of 0.14 is significantly different from 0 even though the standard deviation of the sample was 0.37 (seems pretty large).

**- Question:** seems that 0.14 is less than ½ standard deviation away from 0, how can it be significantly different from 0?

**- Answer:** We should NOT be looking at the standard deviation of the sample, but the standard deviation of the sample mean. In this particular sample, the size is 182. The standard deviation of the sample mean is 0.37/sqrt(182) = 0.03. So 0.14 is about 5 standard deviations away from 0!

5. When looking at the relationship between two (or more) variables, we need to look at the distribution of these variables to decide which test to use (look at Excel sheet).

6. None of the tests that we’ve seen should be used to establish causality unless a bunch of other conditions have been met (e.g., randomization, temporal precedence, etc.)

- **Note:** The terms association and correlation are often used interchangeably

7. All hypothesis tests come with 2 types of error, and relationships that you find might be spurious!

- <http://twentytwowords.com/funny-graphs-show-correlation-between-completely-unrelated-stats-9-pictures/>

8. Statistical significance (or the lack thereof) isn’t everything. The findings need to be practically/clinically significant as well in order to be important.

9. When dealing with larger sample sizes, even small differences will become significant; when dealing with smaller sample sizes, even large differences may not be.

10. Statistics is an art as much as it is a science.

