**Topic 17**

**Tests of Significance: Proportions**

MOTIVATION.

How do we know we are dealing with the parameter value we think we are dealing with? TEST IT!

Note that this is different from Confidence Intervals, which is a sort of estimation. Here we are saying yes or no.

Essentially what we do in statistical testing is we make an assertion, like mean = 5. We draw some data from the system, and we use information that we learned about sample statistics to see if the assertion makes sense. The argument we use is a probabilistic one. With the data we calculate a statistic, in this case $\overbar{x}$, and then we calculate the probability that the value of $\overbar{x}$ would occur for a distribution of µ=5.

If the probability is low enough, meaning very unlikely, our assertion fails. It fails because we assume that the event occurred because µ is not 5, but some other value.

Any statistic or parameter can be tested. Anything. Really. Anything.

The Null Hypothesis means the distribution is what we think it is. Nothing has changed.

The *Alternative* Hypothesis means there is something else going on. Something has changed.

Statistical testing is a process

* Remember that there are Six Steps
* Memorize the six steps with this mnemonic: POe AT ToPS[[1]](#footnote-1)
	1. P - Parameter, Variable, and Population
	2. O - Null Hypothesis, denoted by HO
	3. A – Alternative Hypothesis, HA
	4. T – Technical Conditions
	5. T – Test Statistic
	6. P - p-value
	7. S – Summary decision

The **Significance Level**, or just **Level** tell us how strong the test is. They seem to be somewhat arbitrary, but do occur at meaningful locations.

* .1 or 10% level means that the event might occur randomly in 1 out of 10 samples. This level is considered to be weak evidence that the mean has changed.
* .05 or 5% level means that the event might occur in 1 out of 20 samples. (because .05/1=20, .05 is one twentieth of one). This is considered to be strong evidence.
* .01 or 1% level mean that the event might occur in 1 out of 100 samples. (.01/1=100) This is very strong evidence.

To give an example of how we might use level in a summary, we would say the event occurred at the 5% level with a p-value of .023. Note that p-value must be equal or less than a level associated with it. Otherwise you are committing some sort of Fraud. You are claiming there is more evidence than there actually is.

1. You know, Alexander Graham Poe, the phone poet. He loved Tops Market. Ok, it stinks, but mnemonics work. Come up with your own if you wish. [↑](#footnote-ref-1)