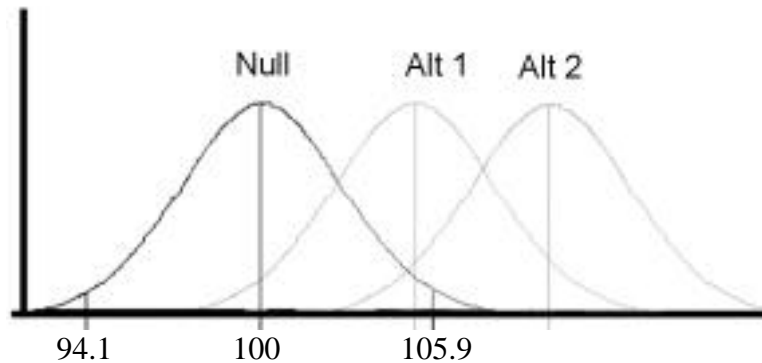


Hypothesis Testing

We were talking about the logic of hypothesis testing, which led me to consider some other ways to portray the situations that emerge in hypothesis testing. For that purpose, I've created the illustration below. Let's assume that we're dealing with the sampling distribution of means for samples of $n = 25$ drawn from a population with $\mu = 100$ and $\sigma = 15$. That is, the standard error would be 3. In essence, then, the critical regions of this distribution would be marked by values that were ± 1.96 standard deviations from the mean.



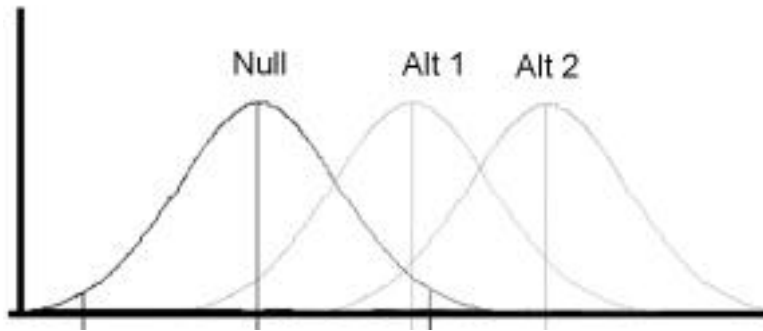
So, let's think of the situation like one in which you were making a bet. If you obtained a sample mean of 103, which distribution would you bet it came from, the Null, Alternative 1, or Alternative 2? Can you see that the Null and Alternative 1 make more sense than Alternative 2? Can you also see that it could have actually come from any of these three distributions (as well as many other populations that I haven't illustrated)?

Given our hypothesis testing procedures, we would make the decision to retain H_0 if we obtained a sample mean of 103. However, we need to recognize that the sample could have been drawn from Alternative 1 (or some other alternative populations with means that fall between the Null and Alternative 1).

Now, suppose that you obtained a sample mean of 107. Note that you would now make the decision to Reject H_0 , concluding that your sample was drawn from a population with $\mu > 100$. Thus, your sample could have been drawn from Alternative 1 or from Alternative 2. Can you see how either of those populations would make more sense than the Null (in terms of making a bet)? However, you should also see that it is possible to get a sample mean of 107 from the Null distribution, even though it is not a likely result.

Using the figure above, shade in the four options (Type I error, Type II error, Power, and Correct Retention of H_0). Can you see how Power and Type II probabilities differ depending on whether your sample mean came from Alternative 1 or Alternative 2?

Now, suppose that your sample was $n = 100$. How would that change your hypothesis testing. Work through the logic from above to be sure that you understand the implications of the increase in sample size.



Here's another copy of the figure for you to play with. ☺

