

# Hypothesis Tests

## Intro to P-Value

"Sampling Variability"  
 Random sample data will usually disagree with the null hypothesis, even if null hypothesis is correct.

Key Question:  
 Why does my sample data disagree with the null hypothesis  $H_0$ ?

$H_0$  correct and disagrees because sampling variability. X could be  
 OR  
 $H_0$  is wrong. ✓  
 ???  
 Don't know!

Def: P-value  
 The probability of getting the sample data (sample statistic) or more extreme by sampling variability if the null hypothesis is true.

Low P-value  
 Close to zero  
 (Lower than Sig. Level  $\alpha$ )

- Unlikely to be sampling variability
- Significant Evidence

(If sample data unbiased passes assumptions)

- Reject  $H_0$

High P-value  
 (Higher than Sig Level  $\alpha$ )

- Could be sampling variability
- Not significant Evidence
- Fail to reject  $H_0$ .

Significance ( $\alpha$ ) (Alpha) Levels

- 1% ( $\alpha = 0.01$ )
- 5% ( $\alpha = 0.05$ )
- 10% ( $\alpha = 0.10$ )

Ex: 32.7%  
 P-value = 0.327  
 Sig Level = 5% ( $\alpha = 0.05$ )

High P-value!  
 Could be Samp Varab.  
 Fail to reject  $H_0$

Ex: P-value =  $1.74 \times 10^{-5}$   
 0.01 Sig level 1%  
 more decimal 5 places left.  
 0.0000174  
 = 0.00174%

Low P-value  
 Unlikely to be sampling variability  
 Reject  $H_0$