AP Statistics – Chapter 10 Notes: Comparing Two Population Parameters

10.1: Comparing Two Proportions

Conditions for Comparing Two Proportions

- **Random**– We have two random samples, from two distinct populations
- **Independence** – Each sample must be selected independently of the other (no pairing or matching) and each distinct population size must be 10 times greater than their samples**.**
- **Normality** – Counts of all "successes" and "failures" are at least 10.

Two-Proportion z Confidence Interval

To estimate the difference between two population proportions ($p_1 - p_2$) use the formula

$$(\hat{p}_1 - \hat{p}_2) \pm z^* \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$$

Two-Proportion z-Test

To test the hypothesis H_0: $p_1 = p_2$, compute the two-proportion z statistic

$$z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\frac{\hat{p}_c(1-\hat{p}_c)}{n_1} + \frac{\hat{p}_c(1-\hat{p}_c)}{n_1}}}$$

Where $\hat{p}_c = \frac{x_1+x_2}{n_1+n_2}$ given that $\hat{p}_1 = \frac{x_1}{n_2}$ and $\hat{p}_2 = \frac{x_2}{n_2}$

10.2: Comparing Two Means

Two-Sample Problems

- The goal of inference is to compare the responses to two treatments or to compare the characteristics of two populations.
- We have a separate sample from each treatment or each population.

Conditions for Comparing Two Means

- **Random** – We have two random samples, from two distinct populations
- **Independence** – Each sample must be selected independently of the other (no pairing or matching) and each distinct population size must be 10 times greater than their samples.
- **Normality** – Both populations are normally distributed **<u>or</u>** $n_1 \geq 30\ and\ n_2 \geq 30$.

Two-Sample t Confidence Interval

To estimate the difference between two population means ($\mu_1 - \mu_2$) use the formula

$$(\bar{x}_1 - \bar{x}_2) \pm t^* \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

Two-Sample t-Test

To test the hypothesis H_0: $\mu_1 = \mu_2$, compute the two-sample t statistic

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$