V21 - Estimation - Part 4

- Topics relevant to estimating difference in independent means
  - Standardization of the difference to Z
  - Normality of difference
  - Pooled estimate of the sample variance

Course: Statistical Testing & Regression
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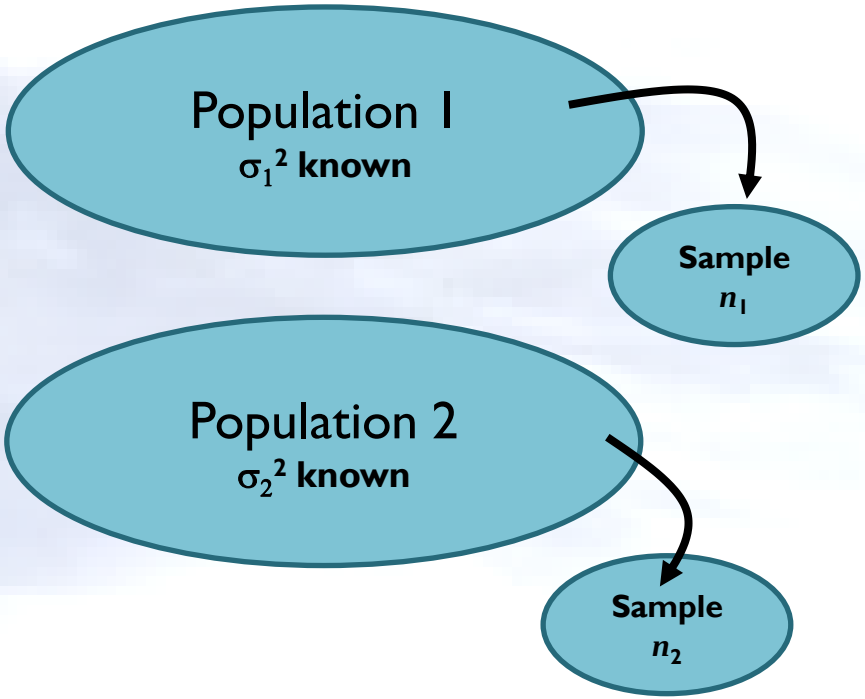
Transformation of difference in 2 sample means to Z



$$Z = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{(\sigma_1^2/n_1) + (\sigma_2^2/n_2)}}$$

$$E(\bar{X}_1 - \bar{X}_2) = \boldsymbol{\mu_1 - \mu_2}$$

$$\text{Var}(\bar{X}_1 - \bar{X}_2) = \frac{{\sigma_1}^2}{n_1} + \frac{{\sigma_2}^2}{n_2}$$

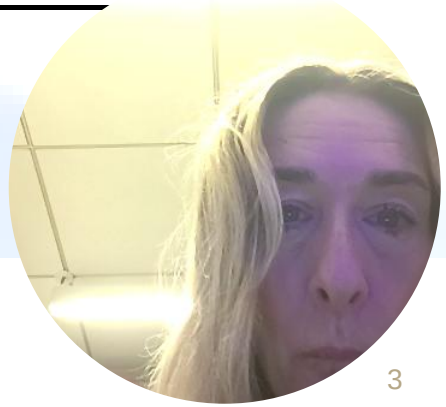
Difference in 2 sample means $(\bar{X}_1 - \bar{X}_2)$ must be normal to transform to Z

x_1 ~ ____ and x_2 ~ ____ →

OR

n_1 & n_2 each ≥ 30 → by the CLT

$\bar{x}_1 - \bar{x}_2$ will be normally distributed because _____ of normal variables is _____

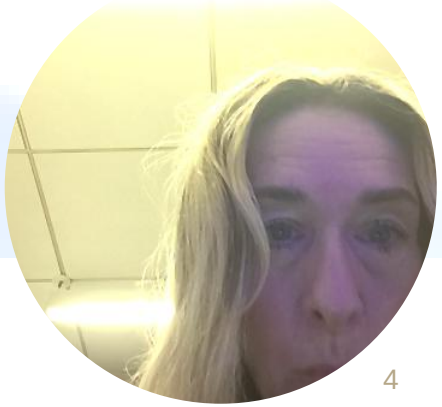


Pooled Estimate of Variance

- Use with T distribution
- When population variances are unknown believed equal $\sigma_1{}^2 = \sigma_2{}^2$, use **Pooled Estimate of Variance**

$$S_p{}^2 = \frac{(n_1 - 1)S_1{}^2 + (n_2 - 1)S_2{}^2}{n_1 + n_2 - 2}$$

- Sample variances are pooled, or _____
- $S_p{}^2$ is weighted average of two sample variances ____ and _____
  - weighted by degrees of freedom _____ and _____
- $S_p{}^2$ better estimator vs. using sample variances ____ and ____ individually



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