Comparing population Means

I. Introduction

A Practical Problem: We would like to compare the average time-loss due to accidents in two groups of industrial plants. One group is following the guidelines of Occupational Safety and Health Act (OSHA) more closely than the other group. What are the steps to do this study?

Consider two populations:

Mean of \( \bar{X}_1 - \bar{X}_2 \) = 

Variance of \( \bar{X}_1 - \bar{X}_2 \) = 

Standard deviation of \( \bar{X}_1 - \bar{X}_2 \) =
II. Two Independent Populations With Known $\sigma_1$ and $\sigma_2$.

a. If the two populations are normal, then $(\bar{X}_1 - \bar{X}_2)$ is distributed as:

This shows that:

**Example:** Time-loss due to accidents
b. A 100( 1- \( \alpha \) ) \% confidence interval for ( \( \mu_1 - \mu_2 \) ) when the population standard deviations are known is:

Example: Time-loss due to accidents
c. To test $H_0 : (\mu_1 - \mu_2) = D_0$, we compute $z =$

and reject $H_0$ in favor of $H_a$ of

$H_a : (\mu_1 - \mu_2) < D_0$ if $z < -z_{\alpha}$

$H_a : (\mu_1 - \mu_2) > D_0$ if $z > z_{\alpha}$

$H_a : (\mu_1 - \mu_2) \neq D_0$ if $z < -z_{\alpha/2}$ or $z > z_{\alpha/2}$

**Example:** Patient Satisfaction

To compare patient satisfaction between two clinics, we selected samples of size 40 from each clinic and recorded the patient satisfaction in the scale of 0 to 5. The mean satisfaction score for the first clinic is 3.23 and for the second clinic 2.95. Suppose the population standard deviation are equal and for both clinics is 0.70. Test $H_0 : (\mu_1 - \mu_2) = 0.10$ vs. $H_a : (\mu_1 - \mu_2) \neq 0.10$ at 0.05 level of significance.
The p-value:

A 95% confidence interval for \((\mu_1 - \mu_2)\) is: