

Determining the Sample Size for Two-Sample Population Means

OVERVIEW

In this lab, you will be determining the sample size for two-sample population means. This lab is intended to help you understand the importance of determining appropriate sample sizes in order to accurately estimate average population scores.

OBJECTIVES

By the end of this laboratory, you will be able to

- Determine sample size for two-sample population means.

EQUIPMENT

- Scientific calculator
- Standard Normal (Z-table)

BACKGROUND MATERIAL

Statistical Terms and Topics

- Sample Size (n)
- Chosen significance level (α)
- Population mean (μ)
- Population and sample variance (σ^2 and s^2 , respectively)
- Population and sample standard deviation (σ and s , respectively)
- Population proportion of success (p)
- Population proportion of failure (q : $q=1-p$)
- Z-value from table
- Confidence interval
- Bound, B : margin of error
- Sample size formulas

FORMULA FOR SAMPLE SIZE TWO - MEANS

To estimate $(\mu_1 - \mu_2)$ to within a given bound B with probability $(1 - \alpha)$, use the following formula to solve for equal sample sizes that will achieve the desired reliability

$$n_1 = n_2 = \frac{\left(z_{\frac{\alpha}{2}}\right)^2 (\sigma_1^2 + \sigma_2^2)}{B^2}$$

You will need to substitute estimates for the values of the variances σ_1^2 and σ_2^2 before you can solve for the sample size. You can use sample variances S_1^2 and S_2^2 from prior sampling, or from an educated and conservatively large guess based on the range formula below, $s \approx \frac{\text{range}}{4}$, thus $s^2 \approx \left(\frac{\text{range}}{4}\right)^2$.

Scenario for Two-Sample Population Mean

Suppose you wish to estimate the difference between two population means correct to within a bound of 3.2 units with a probability .95. You are given information that suggests that the population variances are both approximately equal to = 15 and you want to select independent random samples of equal size from the population. How large must the sample sizes, n_1 and n_2 , be?



Exercise

INSTRUCTIONS

1. Identify the type of problem and the formula that will need to be used.

Type of problem: (mean or proportion, 1-sample or 2-sample) _____

Formula: _____

2. Identify the values needed for the formula.

$$z_{\frac{\alpha}{2}} = \underline{\hspace{2cm}}$$

$$\sigma = \underline{\hspace{2cm}}$$

$$B = \underline{\hspace{2cm}}$$

3. Enter values into formula and evaluate:

Formula:

Answer: *Hint: Don't forget to round to the nearest whole number since the sample size is in whole units, for example people*

4. Write the conclusion in terms of the problem:

Note: the Application to Psychology and Ethics Application hold true for 1 or 2 sample situations.



Application to Psychology

Be sure to find out Sample Size needed before collecting data. When conducting research, if you have a set margin of error be sure to use the formula and calculate the needed sample size before collecting the data. However, you also have to be aware of the number of subject

available to you. Depending on subject availability you may have to adjust the amount of error you are willing to tolerate.

Ethics Application

When you write up your research, be sure to specify the type of sample that was taken. There are several different types of random sample, such as a stratified random sample and a completely randomized sample. Be careful not to make very broad generalized conclusions from very small sample sizes.

