

SAMPLE SIZES BASED ON CONFIDENCE INTERVALS

Recall the soap experiment: Three soaps were tested for solubility. A 1” cube of each was weighed, soaked in water, dried, and weighed again. The difference in weights is the response. A pilot experiment gave estimate 0.007 g for σ . The experimenter wants to be able to detect a weight loss of 0.25 g. We previously estimated sample size based on power.

Now we want to estimate sample size based on joint 95% Bonferroni confidence intervals. So we want

$$\text{msd} \leq 0.25$$

Comparing three means gives three differences we need to estimate. If we use equal sample sizes r for each treatment, then

$$\text{msd} = w_B \sqrt{msE \left(\frac{1}{r} + \frac{1}{r} \right)},$$

and

$$w_B = t(n-v, 1 - .05/(6)) = t(3(r-1), .9917)$$

Estimating msE by .007, we then want

$$w_B^2 (.007)(2/r) \leq (0.25)^2 = 0.0625$$

or

$$w_B^2 \leq (0.0625/0.014)r = 4.464r$$

Use trial and error, starting with $r = 5$ (from our power calculation):

r	3(r-1)	$w_B = t(3(r-1), .9917)$	$t^2 = w_B^2$	4.464r	action
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