SAMPLE SIZE DETERMINATION IN FIXED SAMPLE DESIGNS

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Prerequisites

- Utility of Sample Size Estimation
- Type of Data (Qualitative,/ Quantitative)
- Factors affecting Sample Size

- Type of Study Designs
- Level of Significance/Confidence Coefficient
- Concept of Errors in Testing of Hypotheses

  Type-I error (α)

  Type-II error (β)
- Power of the Test

At planning stage, we have to take decision regarding optimum sample size:

Samples Size depends upon :

- Objective of the Survey
- Type of Data (Qualitative,/ Quantitative) , Summary measure of interest (proportions or means)
- Study Design (cross-sectional/longitudinal/case-control/cohort/experimental etc)

- Critical Variables/most important variables or characters
- Finance and Resources Available
- Degree of precision
- Permissible Error: absolute amount of sample error that can be tolerated

- Desired Confidence Level (1-α)
- Rough idea about/ Expected variability in the study population
- Population size (Finite / Infinite)

SOME BASIC ISSUES BEFORE SAMPLE SIZE ESTIMATION

- How big a risk can be taken that two treatments are incorrectly designated as not significantly different? This risk is referred to as the β error and 1-β is defined as the power of a trail.

- What is the smallest difference d between treatments (in term of a quantitative difference such as a percentage of responders) that is important to detect?

- How big a risk can be taken that the two treatments are incorrectly designated as significantly different? This is, in statistical terms, the level of significance α ?

Concept of Errors in Testing of Hypotheses

- Type-I error (α)

- Type-II error (β)

α = Level of Significance

(1- α) = Confidence Level

(1- β) = Power of the Test

Type I and Type II Errors

Decision on Null Hypo taken on the basis of sample	Actual Situation	
	Null hypothesis is true	Null hypothesis is false
Null Hypothesis Accepted(not rejected)	Correct Decision (*No error)* (1- *α)*	*Type-II error (β)*
Null Hypothesis rejected	*Type-I error*	Correct Decision (1- *β*)

Note:

- Common Choice: $\alpha = 5\%$

  If Power 80% $\beta = 20\%$
- SE decreases with increase in sample size
- Allow 10-20 % non response and inflate sample size by accordingly, eg for 20% non response (divide n_{opt} by 0.8)

SAMPLE SIZES FOR SINGLE GROUP STUDIES

(a) Estimating single mean:

95 % CI for Population Mean:

Mean $\pm$ 1.96 SE

Mean $\pm$ 1.96 $\sigma / \sqrt{n}$

$$\Rightarrow \quad n_{opt} = (1.96)^2 \sigma^2 / \ d^2$$

If, d= 1.96 SE
Then

$$n_{opt} = \frac{4s^2}{d^2}$$

Where d = minimum difference to be tolerated

eg if d = $\pm$ 2, s= 15 ,

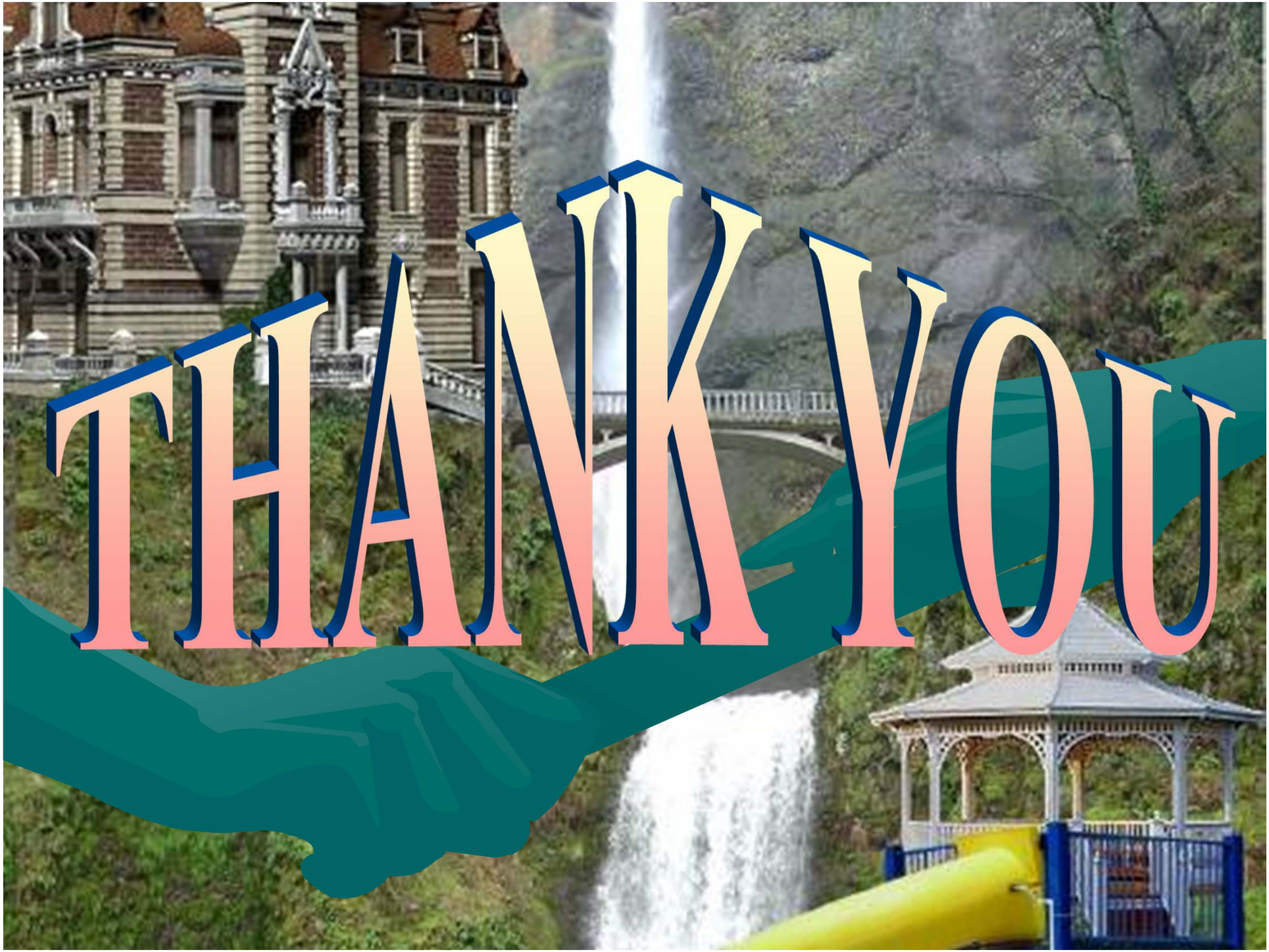
n_{opt} = 216:09 ≈217

For 99% CI, 1.96 is replaced by 2.58

For non response correction

20% of 217= 43.4 ≈ 44

n_{opt} ≈ 217 + 44 = 261


THANK YOU