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POLS 5377 Scope & Method of Political Science

Week 10 Inferential Statistics

Estimation Procedures

Healey. (2016) *Statistics: A Tool for Social Research*, Chapter 7

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Key Questions:

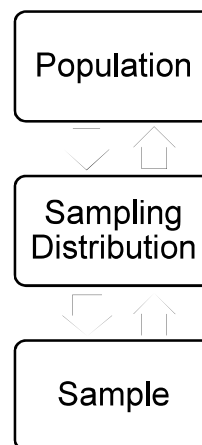
- * How to use the sample and sampling distribution to estimate the population?
- * What is confidence level, how to compute and interpret it?
- * How to compute the estimated confidence intervals?
- * How to report the estimated confidence intervals?

Outline

- * Constructing Confidence Interval
- * Confidence Interval Estimation
- * Report Confidence Interval
- * Width of Interval Estimates

Logic of Estimation

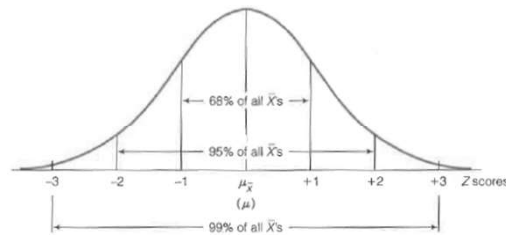
- * Use the sample to estimate the population
- * The sample should be unbiased (use EPSEM techniques)
- * Every time we draw a random sample, we always have the possibility of sampling error.
- * The sample is linked to the population via the sampling distribution
- * According to the central limit theorem, if the sample size big enough, the sampling distribution will be
 - * Normal in shape
 - * $\mu_{\bar{X}} = \mu$
 - * $\sigma_{\bar{X}} = \frac{\sigma}{\sqrt{N}}$



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Sampling Distribution as a Normal Curve

- * The sampling distribution as a normal curve
 - * $\mu_{\bar{X}} = \mu$
 - * 68% of all possible sample means (\bar{X}) is in the range of ± 1 z score
 - * 95% of all possible sample means (\bar{X}) is in the range of ± 2 z score
 - * 99% of all possible sample means (\bar{X}) is in the range of ± 3 z score
- * Example: Estimate the average income in a community
 - * $N = 500$
 - * $\bar{X} = \$45,000$
 - * $\mu_{\bar{X}} = \mu = ?$



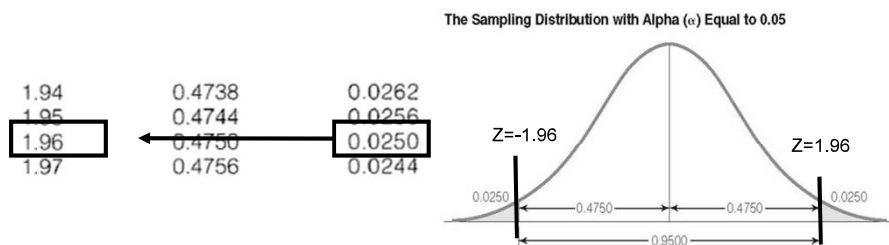
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Constructing Confidence Interval

- * Constructing confidence interval
 - * Step 1: Decide the probability of error: α (alpha)
 - * $\alpha=0.05$ or 95% confidence level are commonly used
 - * Sometimes, we may set the probability of error $\alpha=0.01$ or 99% confidence level

Confidence Interval

- * Step 2: Find the Z score associated with the α by using the normal curve table
 - * If α is equal to 0.05, we would place half (0.025) of this probability in the lower tail and half in the upper tail of the distribution
 - * Looking up this area in column c of the Table, we find a Z of 1.96



Constructing Confidence Interval

- * Step 2: Find the Z score associated with the α by using the normal curve table

Finding the Z Score That Corresponds to an Alpha (α) of 0.05

