STATISTICAL INTERFERENCE

Population parameters vs sample statistics

Population parameters are fixed values while sample statistics vary from one sample to the next

Population parameters are often unknown while sample statistics for a given sample are known

We usually do not know how representative the sample actually is.

Therefore, we do not know how closely the sample statistic approximates the corresponding population parameter.

Mean and Standard Error

Best estimate for population mean μ is sample mean $\bar{x}$

Accuracy of sample mean as the estimate of the population mean is measured by the standard error of the estimate.

The standard error of sample mean is:

$$SE(\bar{x}) = \frac{s}{\sqrt{n}}$$

s is the sample standard deviation and n is sample size.

SE($\bar{x}$) is also referred to as standard error of the mean.

Sample Standard Deviation

A sample deviation is:

$$s = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}$$

$\bar{x}$ is a good estimate if its standard error is less than 5%

Confidence Interval for a Population Mean

A confidence interval can be constructed if:

1. The sample is randomly selected from the population

2. The sample size is at least 25 or the population is normally distributed

A confidence interval for the population mean is given by:

$$\left(\bar{x} - z\frac{s}{\sqrt{n}}, \bar{x} + z\frac{s}{\sqrt{n}}\right)$$

where:

z = 1.645 for a 90% confidence interval

z = 1.96 for a 95% confidence interval

z = 2.58 for a 99% confidence interval

Margin of Error (MOE)

- Another way to express the accuracy of an estimate.
- Instead of saying the 95% confidence interval is (1965 – 31,1965 + 31), we can say the best estimate of the population mean is 1965 with MOE of 31.
- MOE of an estimate is:

$$MOE = 1.96 \times \frac{s}{\sqrt{n}}$$