Estimation of Parameter

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Concept of Statistics?

- It's a body of mathematical techniques or processes for gathering, organizing, analyzing and interpreting quantitative data.
- It's a basic tool of measurement, evaluation and research.
- Sometimes used to describe the numerical data gathered.
- Statistical data describes group behaviour or characteristics obtained from observation of a number of individuals which may lead to generalizations.

Statistic & Parameter

- A statistic is defined as a numerical value, which is obtained from a sample of data. It is a descriptive statistical measure and function of sample observation.
- The common use of statistic is to estimate a particular population parameter.
- A fixed characteristic of population based on all the elements of the population is termed as the parameter. Here population refers to an aggregate of all units under consideration, which share common characteristics. It is a numerical value that remains unchanged, as every member of the population is surveyed to know the parameter. It indicates true value, which is obtained after the census is conducted.

- A statistic is a characteristic of a small part of the population, i.e. sample.
- Parameter is a fixed measure which describes the target population.
- Statistic is a variable and known number which depend on the sample of the population
- Parameter is a fixed and unknown numerical value.

Sampling Error

- A number of samples can be drawn from a population
- The mean weight of the samples would not be identical.
- A few would be relatively high & few relatively low but most would cluster around the population mean
- This variation due to what is known as sampling error (SE)
- Not suggest any fault or mistake in sampling process but merely describes chance variations.
- Chance variations inevitable when no. of samples drawn from a population.

Characteristics of Sample means (central theorem)

- The means of the samples will be normally distributed.
- The mean value of sample means will be same as the population mean.
- The distribution of sample means will have its own standard deviation. This is the distribution of expected sampling error, known as sampling error.

Computation of SE

$$S\bar{x} = \frac{S}{\sqrt{N}}$$

Where S = the standard deviation of individual scores

N = the size of the sample

$s\bar{x}$ = the standard error of the mean

Let us assume

Mean of a sample is 180, S = 12,

Sample size N= 36

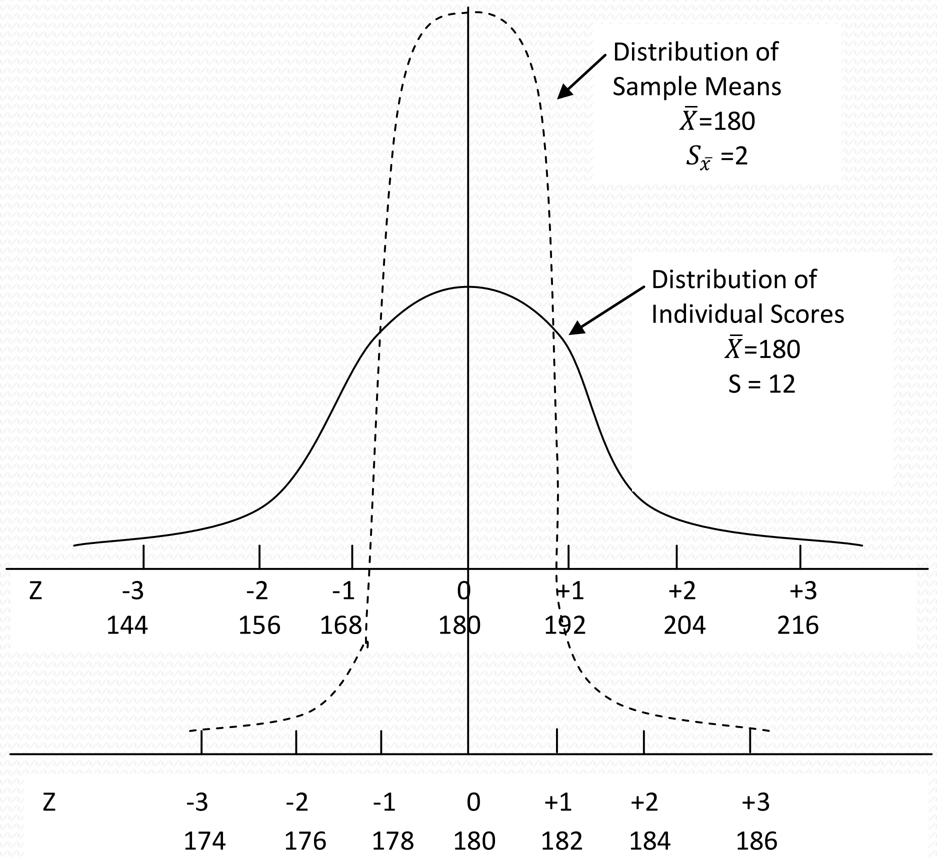
$$S\bar{x} = \frac{S}{\sqrt{N}} = \frac{12}{\sqrt{36}} = \frac{12}{6} = 2$$

It is apparent that as the size of the sample increases, the standard error of the mean decreases or vice versa.

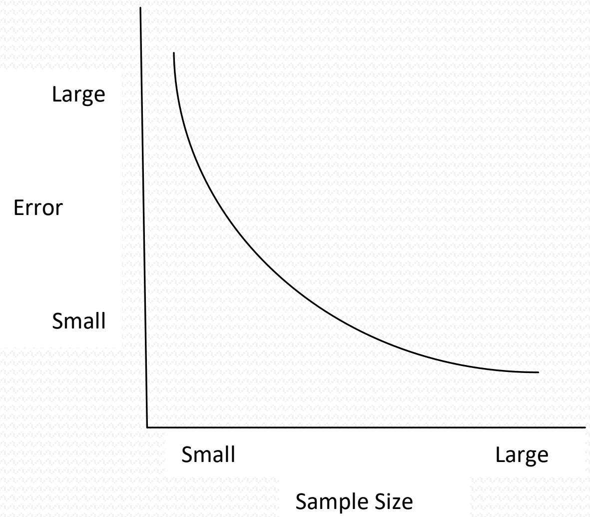
$$S_{\bar{x}} = \frac{s}{\sqrt{\infty}} = \frac{s}{\infty} = 0$$

$$S_{\bar{x}} = \frac{s}{\sqrt{1}} = \frac{s}{1} = S$$

Normal Distribution of Individual Scores and of Sample Means when N = 36



The Relationship between Sample Size and the Magnitude of Sampling Error



Estimation of population mean

- Population mean 'known only to God'.
- Particular mean calculated from a randomly selected sample can be related to the population mean in the same way as individual score is related to mean.

$\frac{68}{100}$ that the sample mean will not be farther than 1 s$\bar{x}$ from the population mean

$\frac{95}{100}$ that the sample mean will not be farther than 1.96 s$\bar{x}$ from the population mean

$\frac{99}{100}$ that the sample mean will not be farther than 2.58 s$\bar{x}$ from the population mean

- Thus value of a population mean can be estimated on probability basis.
- In the figure shown above , SE of mean = 2 points, approximately a 68/100 probability that a mean of any randomly selected sample (N=36, S=12) would not be 2 points away from population mean;
- 95/100 probability that the sample mean would not be 3.92 points away and
- 99/100 probability that sample mean would not be 5.16 points away

Knowing Confidence Interval

- By Knowing mean & SE of mean of a sample we can determine the confidence interval, within which true mean of the population most likely will be.

$\mu_{95\%}$ (the population mean) = $93 \pm (1.96)\ \mathbf{S}_{\bar{x}}$

$= 93 \pm (1.96)\ 3.2 = 93 \pm 6.27$

$\mu_{95\%}$ = between 86.73 and 99.27

The 99% confidence interval would be

$\mu_{99\%} = 93 \pm (2.58)\ \mathbf{S}_{\bar{x}} = 93 \pm (2.58)\ 3.2 = 93 \pm 8.26$

= between 84.7 and 101.26

THANK YOU