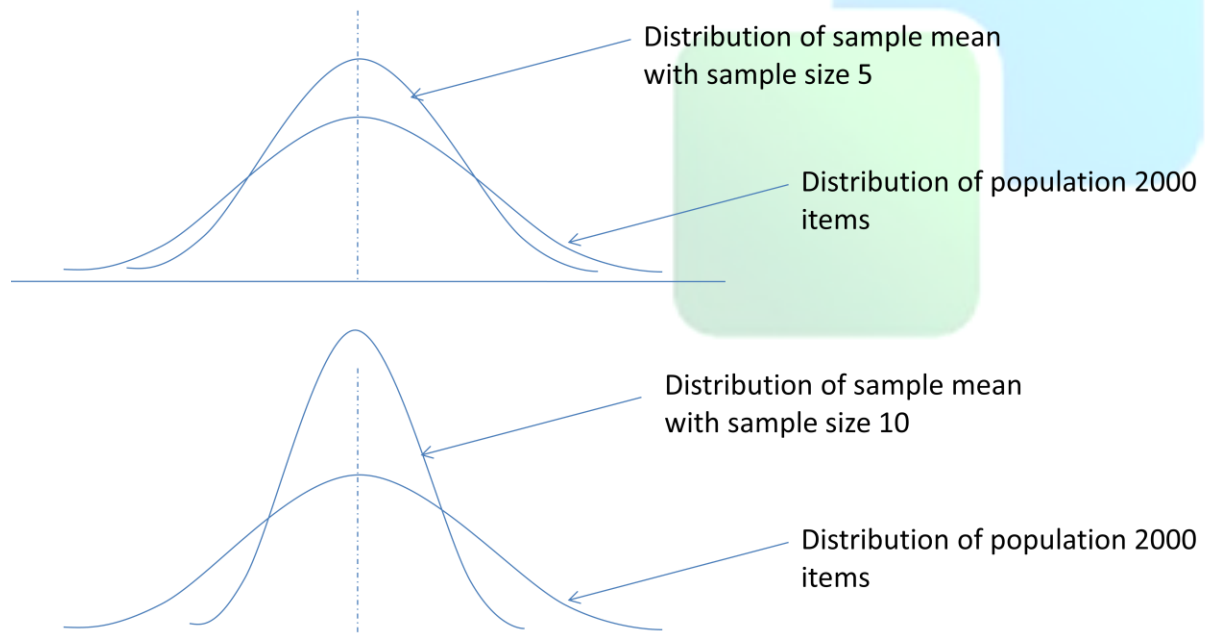We make decision about population basis sampling, it is important to understand the characteristics of sample and population and their relationship.

To understand the importance of sample statistics let us take an example mentioned below.

Let us consider a small population of 2000 items with mean of 100 and standard deviation of 25. Let us draw 40 samples each of sample size of 5 and study their behaviour.

First sample: 93, 95, 101, 97, 104 ➔ Mean: 98

- The mean is closure to the mean of the population while individual data point is farther from population mean both the side.

- Like this, the entire samples mean will be closure to the population mean in compression to the individual values in the respective sample.

- The spread of distribution of such 40 samples mean will be smaller than the spread of 2000 individual items

- Therefore the standard deviation of 2000 individual parts will be larger than standard deviation of 40 means drawn from the population

Distribution of sample mean with sample size 5

Distribution of population 2000 items

Distribution of sample mean with sample size 10

Distribution of population 2000 items

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The standard deviation of sample mean is called standard error and is equal to standard deviation of population divided by square root of sample size.

$$\mathrm{SD}_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

Why considering standard error of mean?
The distribution of sample mean is less spread than the distribution from population
The accuracy of estimation with lesser spread is better than the accuracy of estimation with larger spread

The distribution of means of the samples tends to be normally distributed even if the population distribution is not normal.
This relationship is called **Central Limit Theorem**

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