

PW #5 Statistical estimation (I)

Confidence intervals for mean. Estimation of mean

5.1. Confidence interval for mean

For estimating the mean of a population, the **standard error of the mean (SEM)** will be used, a dispersion indicator showing the degree of dispersion of the sample media around the mean of the population from which they were extracted. The standard error of the mean is calculated according to the equation below.

$$\sigma_{\bar{x}} = \frac{s}{\sqrt{n}} \quad (1)$$

σ is the standard deviation of the error.

s is the standard deviation of the population.

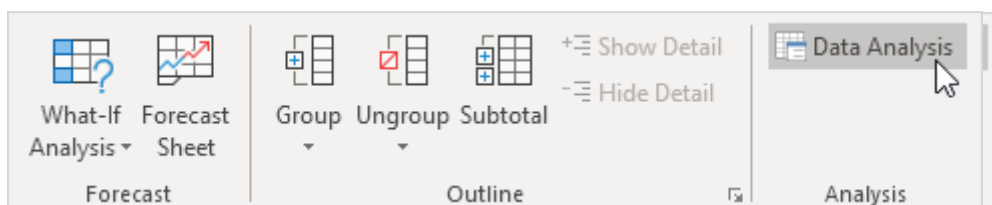
n is the size (number of observations) of the sample.

The mean of the population, will be estimated to be found in the following intervals, depending on the confidence level:

- **68% Confidence interval:** [Mean - SEM; Mean + SEM]
- **95% Confidence interval:** [Mean - 2*SEM; Mean + 2*SEM]
- **99.7% Confidence interval:** [Mean - 3*SEM; Mean + 3*SEM]

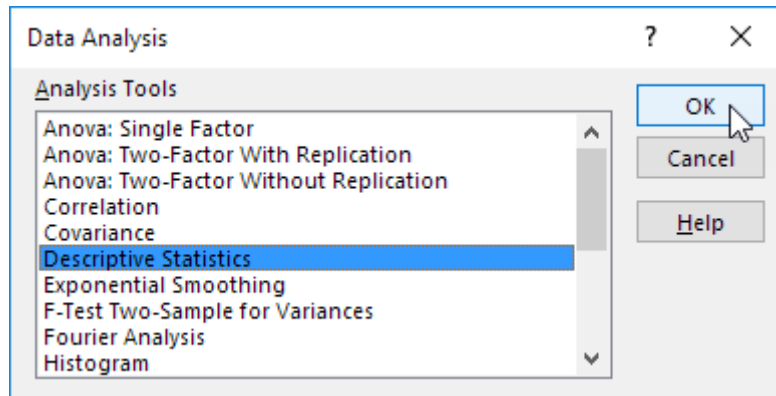
5.2. MS Excel functions of confidence interval for mean

1. Enter MS Excel and open the file.
2. On the **Data tab**, in the Analysis group, click **Data Analysis**.



Note: can't find the Data Analysis button? Click [here](#) to load the [Analysis ToolPak add-in](#).

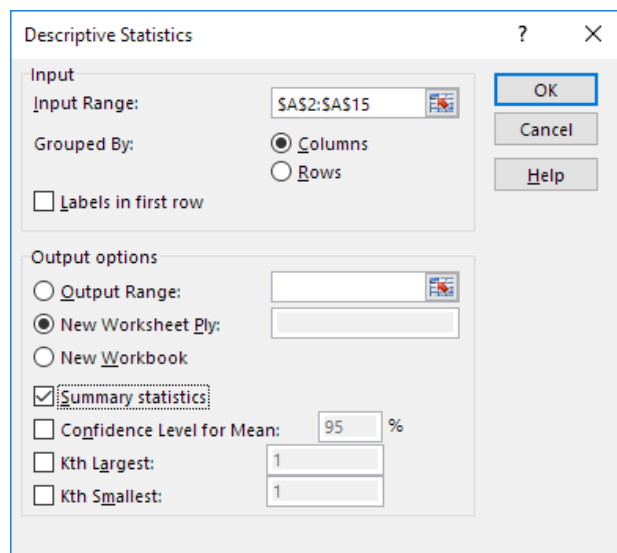
3. Select **Descriptive statistics** and click **OK**



4. Select the range of the numeric variable. (if you include the first row then check **Labels**)

5. Click the Output Range option button, click in the Output Range box and select **New Worksheet**

6. Check **Summary statistics** and hit **OK**



From the results output we are interested in the **Mean**, **Standard Error** and **Standard deviation**
 You also can find the SEM by applying equation (1).

Column1	
Mean	81.21428571
Standard Error	4.045318243
Median	85
Mode	93
Standard Deviation	15.13619489
Sample Variance	229.1043956
Kurtosis	-1.426053506
Skewness	-0.402108004
Range	42
Minimum	58
Maximum	100
Sum	1137
Count	14

Example exercise

1. Using the properties of the normal distribution, **estimate with 99.7% confidence, the average weight of the medical students population.**

Solution

We apply the formula previously described at **confidence interval for mean.**

In order to find the interval of mean weight of the population with a 99.7 confidence, we will use the below formula:

$$[mean - 3*SEM; mean + 3*SEM]$$
$$[81.21 - 3*4.04 ; 81.21 + 3*4.04] \rightarrow [69.09 ; 93.33]$$

We can conclude that with a 99.7% confidence, the mean weight of the population of medical students will be between 69.09 and 93.33kg.