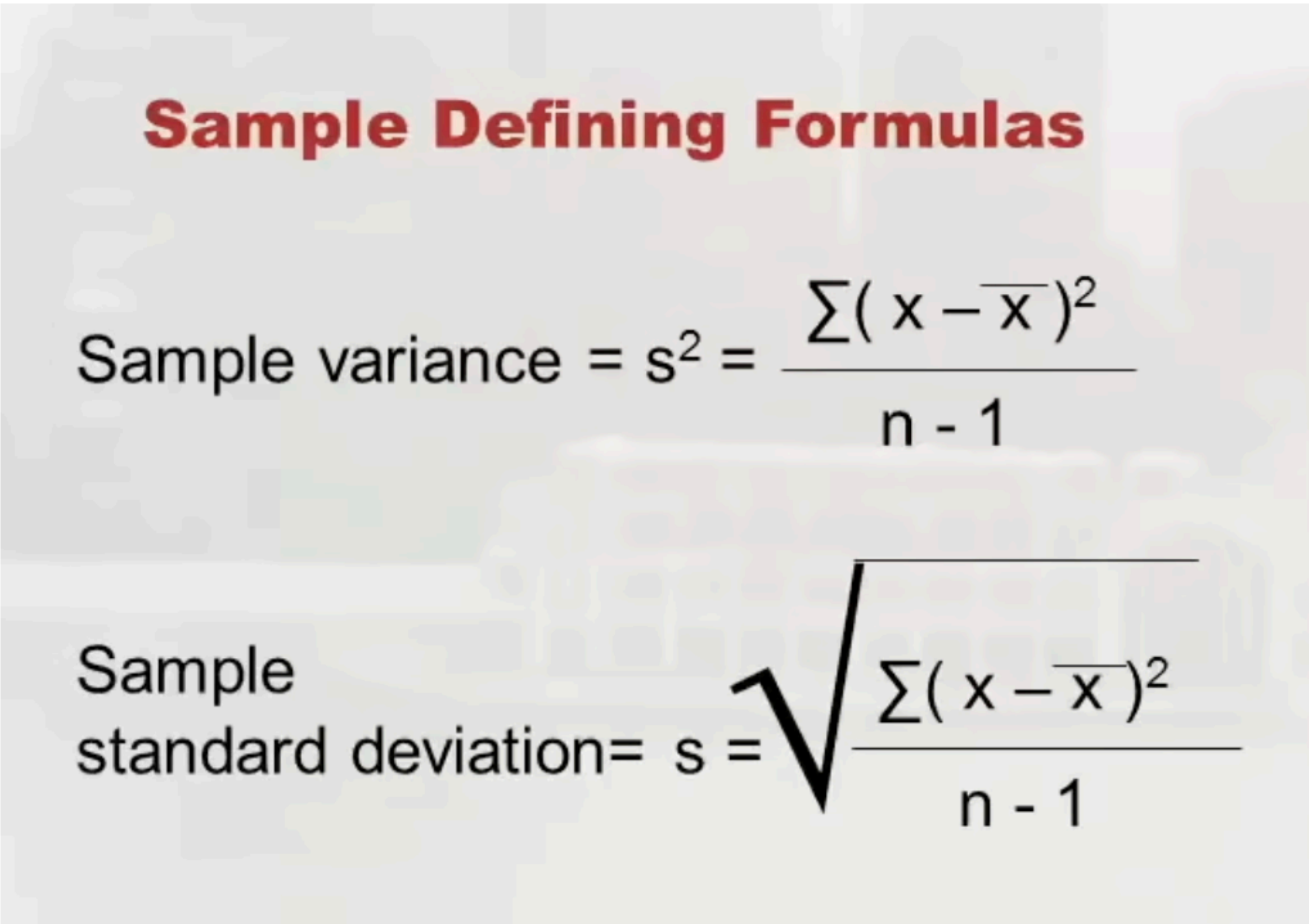
3.2 Measures of Variation

Variation = how much does the data vary

-Measure of Variation

1. Range : is the difference between the maximum and minimum value.
   Ex: 23 12 45 65 76
   76 is the maximum
   12 is the minimum
   so 76-12= 64
   We had a range of 76 minus 12 = 64

Variance and Standard Deviation*
variance:
-How much the data vary
-think: how well does the mean represent the spread of the data
Standard deviation:
-'Standard' - following a standard, same
-'Deviation' - like a deviated septum



Sum of square =

$$\sum (x - \bar{x})^2$$

Sample and Population

Sample Defining Formulas

Sample variance = $s^2 = \dfrac{\sum (x - \bar{x})^2}{n - 1}$

Sample standard deviation = $s = \sqrt{\dfrac{\sum (x - \bar{x})^2}{n - 1}}$

Population Defining Formulas

Population variance = $\sigma^2 = \dfrac{\sum (x - \mu)^2}{N}$

Population standard deviation = $\sigma = \sqrt{\dfrac{\sum (x - \mu)^2}{N}}$

Coefficient of Variation

Coefficient of Variation

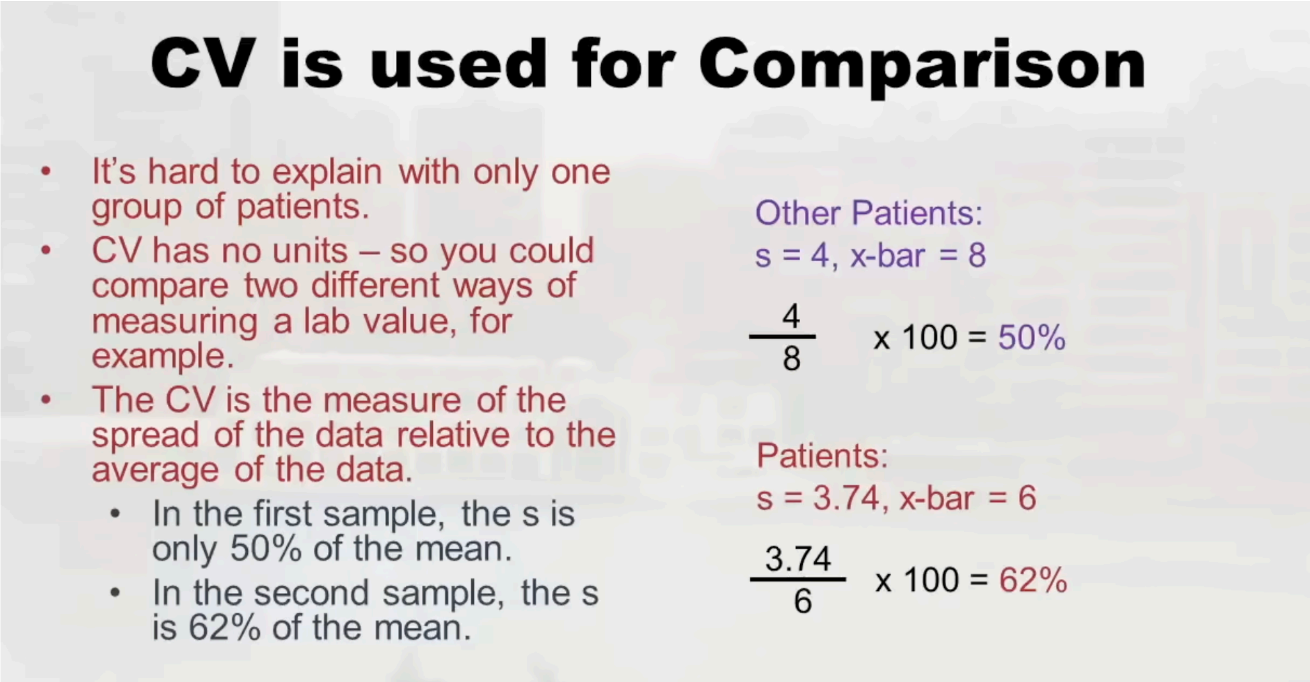
- You will notice the word "coefficient" used a lot in statistics
- Coefficient of Variation is CV for short
- CV shows how much the data varies compared to the mean
- Always expressed in a %

Sample CV = $\dfrac{s}{\bar{x}} \times 100$

Population CV = $\dfrac{\sigma}{\mu} \times 100$

Patients:
$s = 3.74$, x-bar $= 6$

$$\frac{3.74}{6} \times 100 = 62\%$$

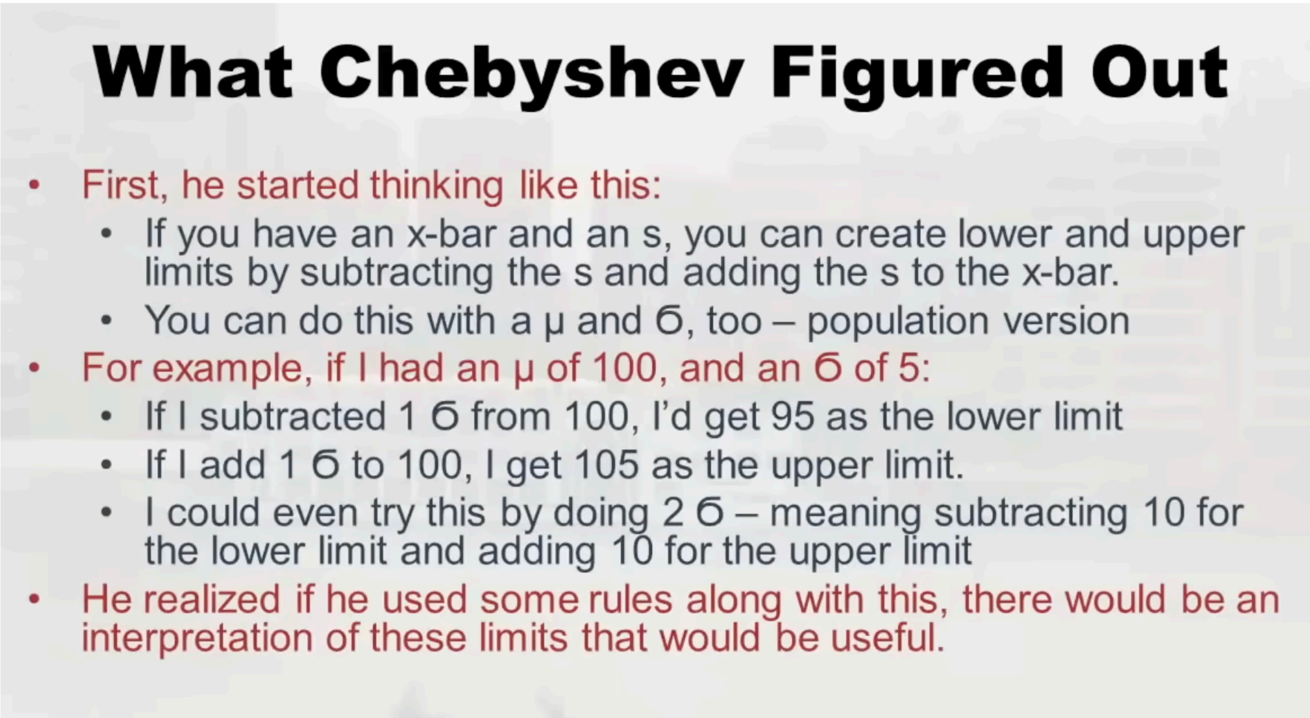


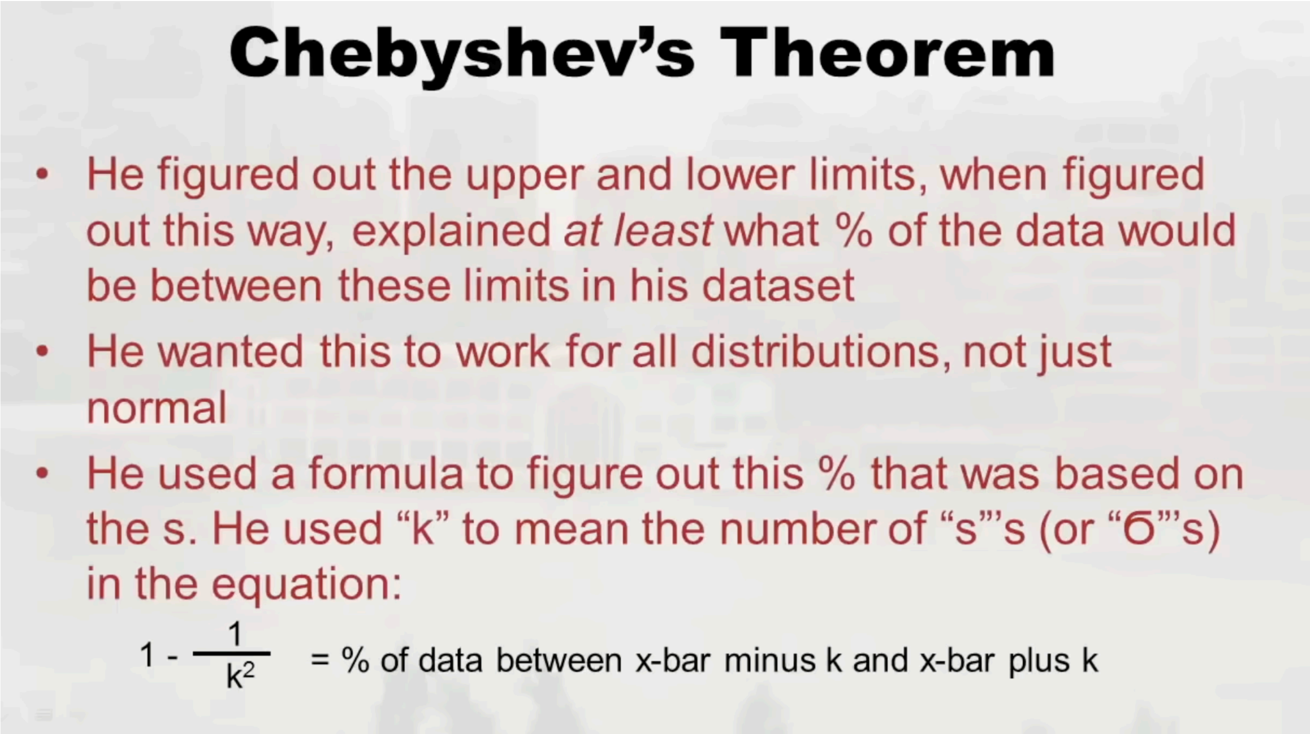
CV, It indicates data consistency:

-a lower CV = higher precision/consistency,

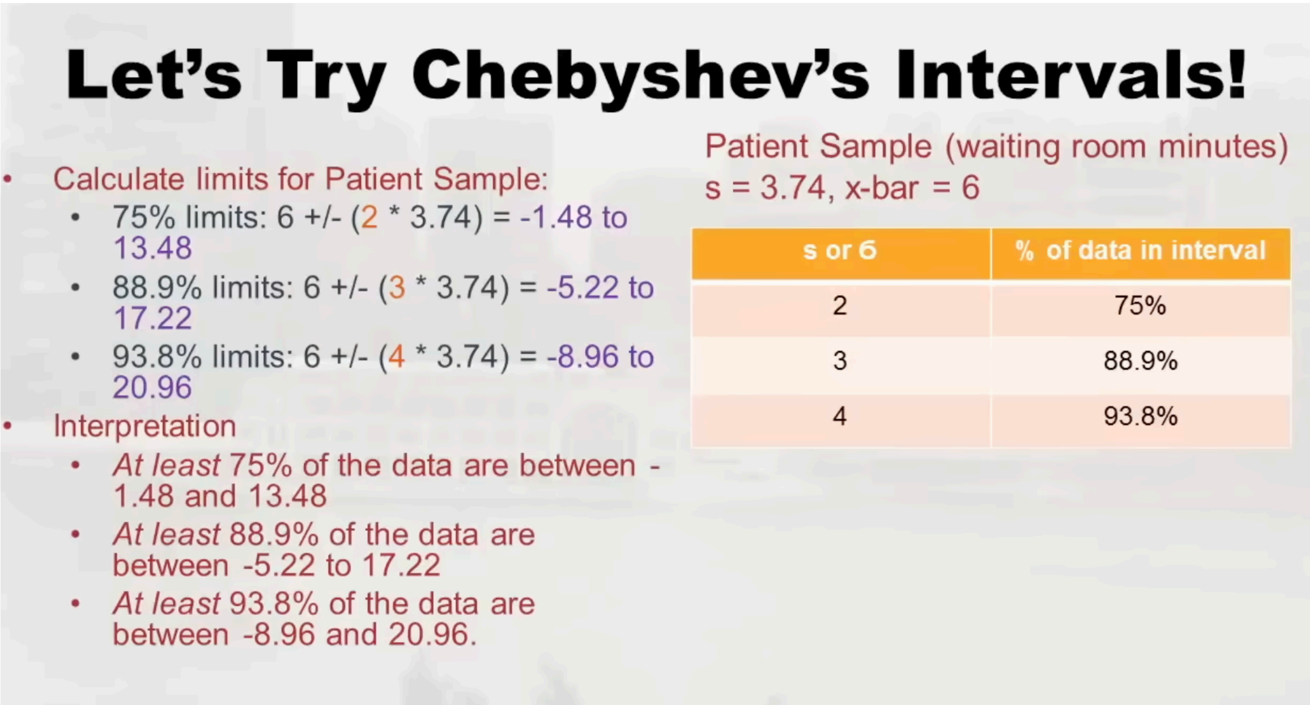
-a higher CV = greater [1]variability.

Chebyshev's Theorem





For example, if a factory produces bolts with a mean length of 5cm and a standard deviation of 0.1cm, Chebyshev's Theorem guarantees that at least 75% of bolts will be between 4.8 cm and 5.2 cm (within 2 standard deviations).



X-bar +_ (n * S)

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1. lack of consistency or fixed pattern; liability to vary or change ↩