BIOE70037 Stats Cheat Sheet

October 13, 2024

1 Population

Population Mean: $$\mu = \frac{1}{N}\sum_{i=1}^{N} x_i \tag{1}$$

Population Variance: $$\sigma^2 = \frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2 \tag{2}$$

Population standard deviation: $$\sigma = \sqrt{\sigma^2} \tag{3}$$

Variance of the mean: $$\mathrm{Var}(\bar{X}) = \frac{\sigma^2}{n} \tag{4}$$

Population size: $$N \tag{5}$$

2 Sample

Sample Mean : $$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \tag{6}$$

Sample Variance (Bessel's): $$s^2 = \frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2 \tag{7}$$

Standard deviation: $$s = \sqrt{s^2} \tag{8}$$

Variance of the sample mean: $$\mathrm{Var}(\bar{x}) = \frac{s^2}{n} \tag{9}$$

Sample Standard Error: $$SE = \frac{\sigma}{\sqrt{n}} \overset{\text{est}}{\simeq} \frac{s}{\sqrt{n}} \tag{10}$$

z-value: $$z = \frac{x - \bar{x}}{s} \tag{11}$$

Confidence Interval: $$CI = \bar{x} \pm z \cdot SE \tag{12}$$

Sample size: $$n \tag{13}$$

3 Notes

1. **eq. (2) N vs. eq. (7) $n-1$**

   Bessel's correction should only be used when dealing with sample, not populations, hence only in eq. (7)

2. **Difference between eq. (4) and eq. (9):**

   Equation (4) gives the variance of the mean as a random variable, meaning the variance of a *random* sample.

   Equation (9) gives the variance of the mean of a *particular* sample.