

**Expected value or mean**

$$E(X) = \mu$$

How do you show that the expected value of the mean of a random variable equal the “true” mean of the variable?

$X_i$  be a simple random sample from a population with mean  $\mu$

$$\begin{aligned}\bar{X} &= \sum_{i=1}^n X_i \\ &= \frac{1}{n}(X_1 + X_2 + \dots + X_n) \\ E(\bar{X}) &= E\left(\frac{1}{n}(X_1 + X_2 + \dots + X_n)\right) \\ &= \frac{1}{n}E(X_1 + X_2 + \dots + X_n) \\ &= \frac{1}{n}(E(X_1) + E(X_2) + \dots + E(X_n)) \\ &= \frac{1}{n}(\mu + \mu + \dots + \mu) \\ &= \frac{1}{n}(n\mu) \\ &= \mu\end{aligned}$$