

1. Observational study.

(a) Non-response bias.

(b) List of registered voters.

$$(c) \frac{1}{\sqrt{n}} \times 100 = \frac{1}{\sqrt{658}} \times 100 = 3.90$$

(d) Yes, because the true percentage can be within 24.9 ± 3.9 or $(21.0, 28.8)$, which is above 20.

$$(e) \frac{1}{\sqrt{n}} \times 100 = 2.5 \Rightarrow n = 1600$$

2. Types of variables.

(a) Quantitative / discrete

(b) Categorical

(c) Quantitative / continuous

(d) Categorical

3. Numerical summary of data.

(a) Note: $\sum x = 12$; $\sum x^2 = 36$; $n = 7$

$$\bar{x} = \frac{\sum x}{n} = \frac{12}{7} = 1.714$$

$$s = +\sqrt{\frac{\sum x^2 - (\sum x)^2/n}{n-1}} = +\sqrt{\frac{36 - (12)^2/7}{7-1}} = 1.604$$

$$(b) z = \frac{x - \bar{x}}{s} = \frac{5 - 1.714}{1.604} = 2.05$$

Study hours of 5 is 2.05 standard deviations above the mean.

4. Experimental study.

Placebo effect refers to a phenomenon in which participants receiving placebo show improvements.

5. Graphical summary of data.

(a)

Stem	Leaf
7	55
8	005
9	0055
10	0
11	5
12	
13	0

(b) $\{\min, Q_1, Q_2, Q_3, \max\} = \{7.50, 8.00, 9.00, 9.75, 13.00\}$

6. Variability of data.

(a) $\bar{v} = 8.00$ (5 points higher)

$s_v = 1.58$ (no change in variability)

(b) s_w is larger than 1.58 (values in W are more spread out than U)