

Homework 1

Yuki Joyama

2023-09-23

Problem 1

- a) Qualitative, ordinal
- b) Qualitative, binary
- c) Qualitative, ordinal
- d) Quantitative, continuous
- e) Quantitative, discrete

Problem 2

The depression scores for 14 individuals with a recent bike crash history (I will define this as group A):
45, 39, 25, 47, 49, 5, 70, 99, 74, 37, 99, 35, 8, 59

- a) Descriptive summaries

Mean: $\sum_{i=1}^{14} \frac{x_i}{14} = 49.36$

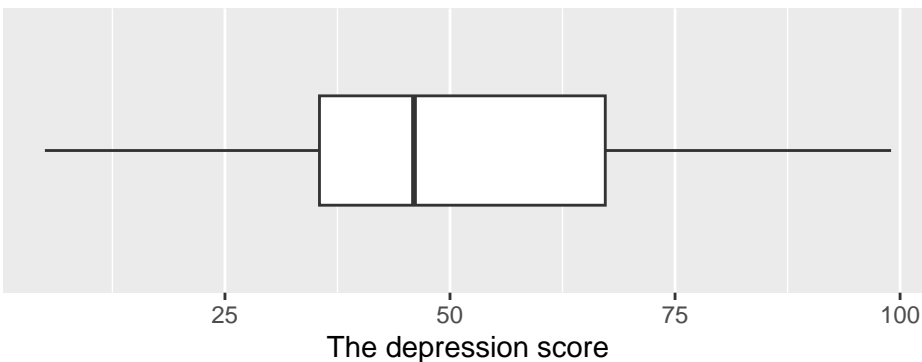
Median: $(45 + 47)/2 = 46$

Range: $99 - 5 = 94$

SD: $\sqrt{\frac{1}{14-1} \sum_{i=1}^{14} (x_i - \bar{x})^2} = 28.85$

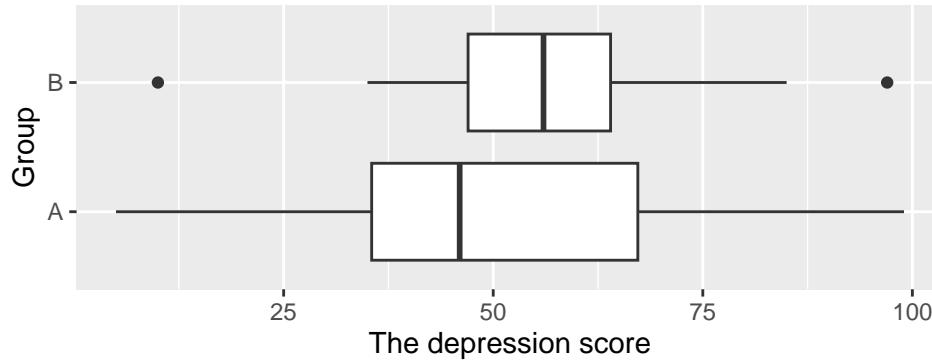
- b) Box plot of the depression scores of group A

The box plot shows right-skewed, unimodal distribution.



The depression scores for 13 individuals with a recent car crash history (I will define this as group B):
67, 50, 85, 43, 64, 35, 47, 97, 58, 58, 10, 56, 50

- a) Side-by-side box plot of the depression scores stratified by type of accident



- b) Based on the box plot, group A appears to have right-skewed, unimodal distribution while group B has left-skewed, unimodal distribution. This is also supported by the fact mean $>$ median in group A and mean $<$ median in group B.
- c) Judging from the box plot, group A appears to have a lower typical depression score.

Problem 3

Tossing one fair 12-sided die.

- a) event A: an even number appears
 Let $\Omega = \{1, 2, \dots, 12\}$
 Let $A = \{2, 4, 6, 8, 10, 12\}$, $A \subset \Omega$
 $P(A) = \frac{6}{12} = \frac{1}{2}$
- b) event B: number 10 appears Let $\Omega = \{1, 2, \dots, 12\}$
 Let $B = \{10\}$, $A \subset \Omega$
 $P(B) = \frac{1}{12}$
- c) $P(B \cup A) = P(A) + P(B) - P(B \cap A)$
 $P(B \cap A)$ is the probability of number 10 appears (which is also an even number), so $P(B \cap A) = \frac{1}{12}$
 Therefore, $P(B \cup A) = P(A) + P(B) - P(B \cap A) = \frac{1}{2} + \frac{1}{12} - \frac{1}{12} = \frac{1}{2}$
- d) If event A and event B are independent, $P(A \cap B)$ should be equal to $P(A)P(B)$.
 Now, given $P(A)P(B) = \frac{1}{2} \times \frac{1}{12} = \frac{1}{24} \neq P(A \cap B)$, we can say that these two events are not independent.