Association versus causation

6 questions | 15 marks

Equivalent correct methods earn the corresponding marks.

1. Umbrella sales and rainfall rise together. Which is a plausible direction of causation? [2 marks]

The context supports rain influencing purchases.

Sales alone do not cause weather.

Answer: Rainfall can increase demand for umbrellas.

2. Towns with more fire engines report more total fire damage. Why is reducing fire engines not justified by this association? [3 marks]

Fire severity can influence both engine numbers and damage.

The observed pattern does not isolate engines' protective effect.

Answer: Larger/more severe fires call out more engines.

3. Coffee drinkers in a survey sleep less. Name a possible confounder. [2 marks]

Shift work/workload may affect both coffee use and sleep.

The survey alone cannot separate these effects.

Answer: For example, shift work or workload.

4. Why does random assignment help a treatment comparison? [3 marks]

Participants do not choose their treatment.

Other influences are less likely to align systematically with treatment.

Answer: It reduces systematic group differences on average.

5. Write a cautious conclusion: more exercise is associated with lower reported stress in a voluntary survey. [2 marks]

Retain the observed direction.

State sample and design limits.

Answer: In this voluntary sample, more exercise is associated with lower reported stress; causation is not established.

6. A company claims its product caused improvement because users improved over a month, with no comparison group. Give two alternative explanations. [3 marks]

Time, other support or natural changes could contribute.

Without a suitable comparison, the product effect is not isolated.

Answer: Practice effects and other changes over the month, for example.