

Understanding correlation

Two things can be related, but that does not mean one causes the other.

*More questions.
Healthier choices.
Tomorrow.*

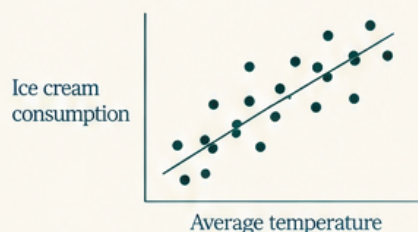
A correlation means that two variables are associated.

A causal relationship means that one variable leads to a change in the other.

To establish causation, we need stronger evidence.

1 Positive correlation

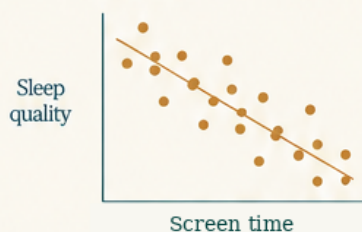
As one variable increases, the other also increases.



Example: On warmer days, more ice cream is consumed. The correlation alone does not establish whether higher temperature causes higher ice-cream consumption.

2 Negative correlation

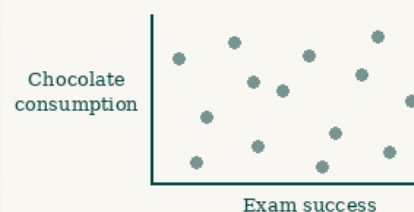
As one variable increases, the other decreases.



Example: More screen time is associated with lower sleep quality. This shows a correlation, but it does not prove that screen time alone causes poor sleep.

3 No clear linear correlation

The points show no clear straight-line pattern.



Example: This sample shows no clear linear association. That alone does not establish independence; a non-linear relationship may still exist.

Correlation is not the same as causation

There are several reasons why two variables may be correlated without a causal relationship:

Third variable (confounding)



Higher temperatures increase both ice-cream consumption and sun exposure. Sun exposure does not cause ice-cream consumption—both are effects of warm weather.

Reverse causation



Lower body weight may lead to higher physical activity, but it is also possible that higher physical activity leads to lower body weight. The direction of the relationship can be reversed.

Chance



Sometimes two variables appear to be related purely by chance, especially when many variables are analysed at the same time.

How can we establish causation?



Randomised controlled trials (when ethical and feasible).



Longitudinal studies (establishing the time sequence).



Biological plausibility (mechanism of action).



Dose-response relationship (larger exposure → larger effect).



Consistent evidence from different types of studies.

When you see a claim, ask:

- ☐ Is this a correlation or a causal relationship?
- ☐ Could a third variable be influencing the result?
- ☐ Does the time sequence support a causal link?
- ☐ Is there a biological mechanism?
- ☐ Is the conclusion supported by different types of evidence?

Key message:

Causal evidence is especially important when assessing whether changing an exposure is likely to change an outcome. Responsible decisions may also draw on well-understood non-causal evidence.

Correlation does not establish causal direction.

