36.1 Interpretation and Communication

Biology

Summarize main points from each video.

Video Title / topic

Video Title / topic

Video Title / topic

Topic Introduction

Summarize your understanding of each paragraph.

For this learning topic, you will become familiar with a few important words: correlation, causation, consequence, and coincidence. All four of these words begin with the letter "C" – each of these relate to a scientists interpretation of data.

In statistics, many statistical tests calculate correlations between variables and when two variables are found to be correlated, it is tempting to assume that this shows that one variable causes the other.

That "correlation proves causation," is considered a questionable cause logical fallacy when two events occurring together are taken to have established a cause-and-effect relationship.

A full discussion regarding correlation, causation, consequence, and coincidence will not be covered in this topic – except to elevate several of the general concepts. The short version is this: just because two things are correlated, doesn't mean one causes the other.

https://en.wikipedia.org/wiki/Correlation_does_not_imply_causation

Read/Summarize Text

1. **Read the passage.**
2. **Underline key expressions in each sentence.**
3. **Re-write each word (or expression) you underlined.**
4. **Summarize the passage.**

Correlation does not imply causation

1

2

For any two correlated events, A and B, the different possible relationships include:

- A causes B (direct causation)
- B causes A (reverse causation)
- A and B are consequences of a common cause, but do not cause each other
- A and B both causes C
- A causes B and B causes A (bidirectional or cyclic causation)
- A causes C which causes B (indirect causation)
- There is no connection between A and B; the correlation is a coincidence.

https://en.wikipedia.org/wiki/Correlation_does_not_imply_causation

Re-write words you underlined

3

Using a complete sentence, summarize or rephrase the passage

4

Read Text for Comprehension

Read this article for deeper understanding. No summary is required, although you may want to circle, underline, or mark key ideas and words.

Use of correlation as scientific evidence

Much of scientific evidence is based upon a correlation of variables – they are observed to occur together. Scientists are careful to point out that correlation does not necessarily mean causation. The assumption that A causes B simply because A correlates with B is often not accepted as a legitimate form of argument.

However, sometimes people commit the opposite fallacy – dismissing correlation entirely. This would dismiss a large swath of important scientific evidence. Since it may be difficult or ethically impossible to run controlled double-blind studies, correlational evidence from several different angles may be useful for prediction despite failing to provide evidence for causation. For example, social workers might be interested in knowing how child abuse relates to academic performance. Although it would be unethical to perform an experiment in which children are randomly assigned to receive or not receive abuse, researchers can look at existing groups using a non-experimental correlational design. If in fact a negative correlation exists between abuse and academic performance, researchers could potentially use this knowledge of a statistical correlation to make predictions about children outside the study who experience abuse, even though the study failed to provide causal evidence that abuse decreases academic performance.

> *The combination of limited available methodologies with the dismissing correlation fallacy has on occasion been used to counter a scientific finding. For example, the tobacco industry has historically relied on a dismissal of correlational evidence to reject a link between tobacco and lung cancer, as did biologist and statistician Ronald Fisher.*

Correlation is a valuable type of scientific evidence in fields such as medicine, psychology, and sociology. But first correlations must be confirmed as real, and then every possible causative relationship must be systematically explored. In the end correlation alone cannot be used as evidence for a cause-and-effect relationship between a treatment and benefit, a risk factor and a disease, or a social or economic factor and various outcomes. It is one of the most abused types of evidence, because it is easy and even tempting to come to premature conclusions based upon the preliminary appearance of a correlation.

https://en.wikipedia.org/wiki/Correlation_does_not_imply_causation

Copy Text Below

Copy the Text Below. Read (discuss) for Understanding.

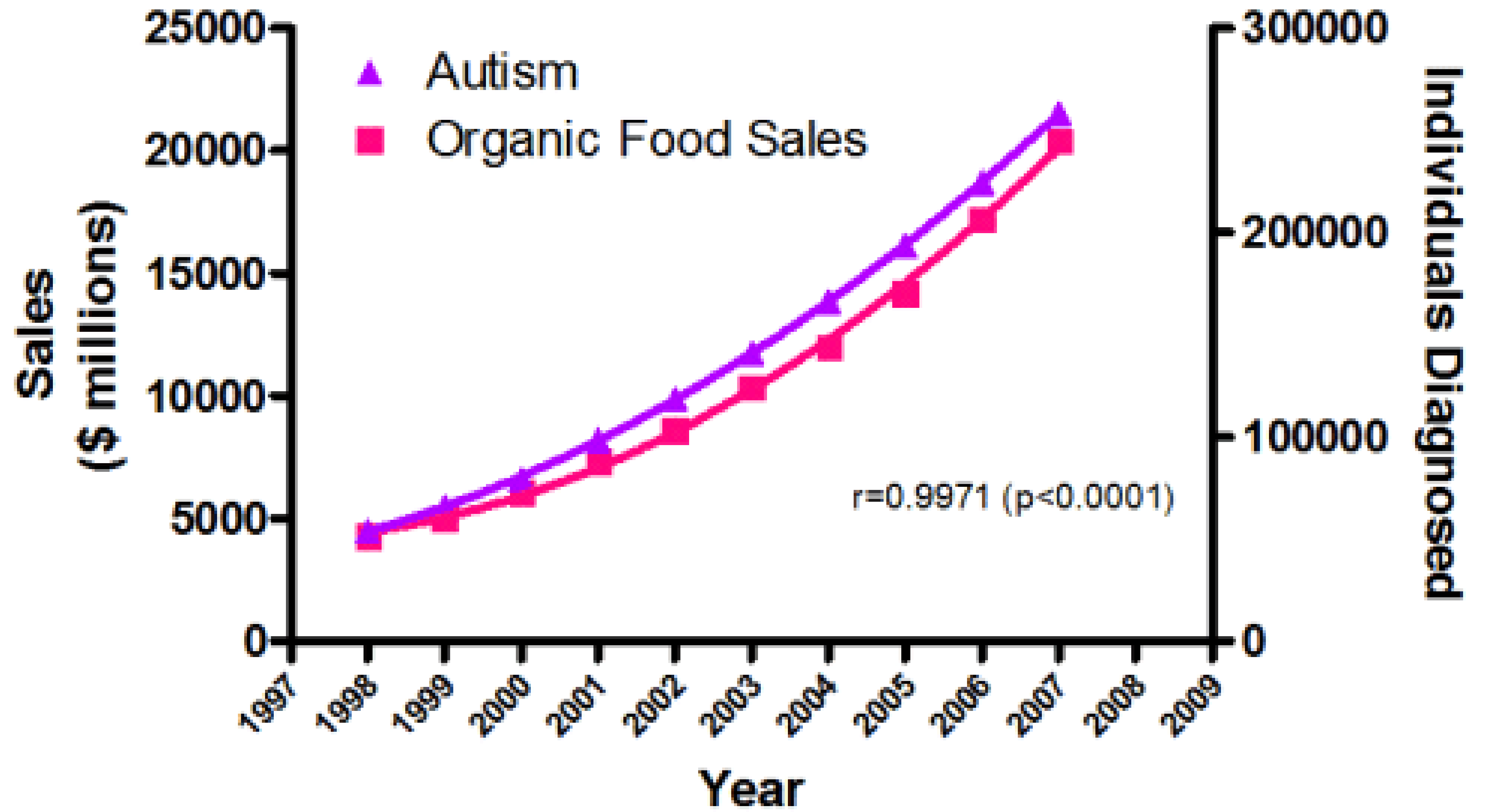
Correlation does not “imply” causation

- "Empirically observed covariation is a necessary but not sufficient condition for causality."
- "Correlation is not causation but it sure is a hint."
- If Y and X correlate significantly, then one of the following may be true:
  - X causes Y
  - Y causes X
  - X and Y are consequences of a common cause other than X or Y
  - Just coincidence

Adapted from: https://www.slideshare.net/WenShengChang/sas-corr

Copy text here …

View Graph. Read Text. Discuss as a Class.



Sources: Organic Trade Association, 2011 Organic Industry Survey; U.S. Department of Education, Office of Special Education Programs, Data Analysis System (DANS), OMB# 1820-0043: "Children with Disabilities Receiving Special Education Under Part B of the Individuals with Disabilities Education Act

http://www.ithinkwell.org/autism-correlation-does-not-equal-correlation/

One of the commonest mistakes when looking at data is to think that correlation means causation. For example, children are sometimes diagnosed with autism shortly after they are vaccinated and parents then believe that the vaccination caused the autism. However, the commonest age at which children are diagnosed with autism is also the age at which they get vaccinated. So we would expect these events to occur together sometimes.

The above graph shows a close correlation between the sales of organic foods and the number of autism cases diagnosed. No-one has suggested that organic food causes autism and there are no grounds to believe it does. This is a good example, therefore, to illustrate that correlation does not mean causation.

Show-Off Your Smarts!

Instructions

- Complete as an individual or small group.
- Discuss your ideas/answers/responses in a small group.
- Select one person to present your responses to the class.

Q1. How can this information be applied to a young-person's life?

Q2. How does this information apply to (or impact) communities?

Q3. When do scientists need to apply this information? How?

Q4. How would a person from 100 years ago view this information?

Q5. How does this topic connect to other science topics or math?

Write down at least three words introduced or covered by this topic.

1.
2.
3.
4.
5.
6.

Make a Poster

In the space provided here, create/draw a poster which conveys the concepts you have learned on this topic.