Lesson 21: How do observational studies contribute to our understanding of the world?



Read the article

The Trouble With Tylenol and Pregnancy By MOISES VELASQUEZ-MANOFF

Observational Study?

A study that observes individuals and measures variables of interest but does not attempt to influence the responses.



Prospective study

future outcomes

Study in which subjects are followed to observe

Retrospective study

study in which subjects are selected and then their previous conditions or behaviors are determined

"observe in the wild"

M. Singh

Think of and note down one example of a retrospective and observational study each to share with the class



Although an observational study may identify important variables related to the outcome we are interested in, there is no guarantee that we have found the right or the most important related variables.

A recent medical study revealed that among men who have had a heart attack, those with a higher level of a certain protein in their blood are at greater risk to have a second attack. In situations like this, students should think of three possibilities.

Xcauses Y: The protein causes heart attacks.

Y causes X: The risky condition of the patient's heart produces the protein.

X and Y both result from a third (lurking) variable: Some other unknown aspect of the patient's physical condition or body chemistry causes the second heart attack and also produces the protein as a harmless by-product.

Which is it?

We don't know.

M. Singh

In early 2007, a larger-than-usual number of cats and dogs developed kidney failure; many died. Initially, researchers didn't know why, so they used an observational study to investigate.

Question: Suppose you were called on to plan a study seeking the cause of this problem. Would your design be retrospective or prospective? Explain why.



I would use a retrospective observational study. Even though the incidence of disease was higher than usual, it was still rare. Surveying all pets would have been impractical. Instead, it makes sense to locate some who were sick and ask about their diets, exposure to toxins, and other possible causes.

Lurking variables are a common problem in observational studies, when an apparent association between two variables is really just common response to a third unseen variable.

Think of an observational study where a lurking variable may be the reason for an association between variables being studied



An example

'positive association between ice cream sales and

drownings. What is explanatory and what is response? Should we conclude that when people are saddened to hear of drownings in the news they attempt to cheer up by eating ice cream?

Or, more likely, that it's dangerous to eat ice cream before you go swimming? In fact, the explanatory variable is probably summer heat, leading to both more ice cream sales and more drownings.'

Another example

'strong positive association between the number of firefighters at a fire and the amount of damage. Perhaps you shouldn't call the fire department... The lurking variable is the size of the blaze, which "causes" both damage and determines how many fire fighters show up.'

Careful: lurking variables are not always so easy to identify

Lurking variable examples are cautionary tales warning us **not** to infer causation from association.

MS and vitamin D. Multiple sclerosis (MS) is an autoimmune disease that strikes more often the farther people live from the equator. Could vitamin D-which most people get from the sun's ultraviolet rays-be a factor? Researchers compared vitamin D levels in blood samples from 150 U.S. military personnel who have developed MS with blood samples of nearly 300 who have not. The samples were taken, on average, five years before the disease was diagnosed. Those with the highest blood vitamin D levels had a 62% lower risk of MS than those with the lowest levels. (The link was only in whites, not in blacks or Hispanics.)

- a) What kind of study was this?
- b) Is that an appropriate choice for investigating this c) Who were the subjects?
- d) What were the variables?

Heart attacks and height. Researchers who examined health records of thousands of males found that men who died of myocardial infarction (heart attack) tended to be shorter than men who did not.

- a) Is this an experiment? If not, what kind of study is it?
- b) Is it correct to conclude that shorter men are at higher risk for heart attack? Explain.

Multiple Choice

 A company sponsoring a new Internet search engine wants to collect data on the ease of using it. Which is the best way to collect the data?

 A) census
 B) sample survey
 C) observational study

 D) experiment
 E) simulation

Be ready to provide a reasoning for choosing or NOT choosing any method.

Note

- Observational studies are valuable for discovering trends and possible relationships.
- However, it is not possible for observational studies, whether prospective or retrospective, to demonstrate a causal relationship.