

What is reverse causation and what are some examples of it?

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Reverse causation is a phenomenon where the assumed cause and effect relationship between two variables is actually the opposite. In this scenario, the effect is mistaken as the cause and the cause is misinterpreted as the effect. This can lead to incorrect conclusions and misinterpretations of data. For example, a study may find a correlation between increased ice cream sales and higher crime rates. This could be mistakenly interpreted as ice cream causing crime, when in reality, warmer weather (the true cause) leads to both increased ice cream sales and higher crime rates. Other examples of reverse causation include mistaking symptoms as the cause of a disease, or assuming that education causes success when it is actually the other way around. It is important to carefully analyze data and consider all possible factors to avoid falling into the trap of reverse causation.

Reverse Causation: Definition & Examples

Reverse causation occurs when you believe that X causes Y, but in reality Y actually causes X.

Reverse Causation

When you think X causes Y...



But in reality Y actually causes X...



This is a common error that many people make when they look at two phenomenon and wrongly assume that

one is the cause while the other is the effect.

Example 1: Smoking & Depression

One common error of reverse causation involves smoking and depression.

In an observational study, researchers may observe that people who smoke more tend to be more depressed. Thus, they may naively assume that smoking *causes* depression.

However, it's possible that researchers are getting this backwards and in reality depression actually causes people to smoke because they view it as a way to alleviate their negative emotions and blow off some steam.

Example 2: Income & Happiness

Another common error of reverse causation involves annual income and reported happiness levels.

In an observational study, researchers may observe that people who earn higher annual incomes may also report being happier overall in life. Thus, they may simply assume that higher income leads to more

happiness.

However, in reality it may be true that people who are naturally happier tend to be better workers and thus earn higher incomes. Thus, researchers may actually get the relationship backwards. Higher income might not cause more happiness. More happiness might be the cause for higher income.

Example 3: Drug Use & Mental Wellbeing

Another example of reverse causation involves drug use and mental wellbeing.

In an observational study, researchers may observe that people who use drugs may also have lower levels of reported mental wellbeing. Researchers may then naively assume that drug use *causes* lower mental wellbeing.

In reality, it may be that people who naturally have lower levels of wellbeing are more likely to use drugs, which means that the true relationship between drug use and mental wellbeing is reversed.

Judging Causality

One way to assess the causality between phenomenon is to use the **Bradford Hill Criteria**, a set of nine criteria proposed by English statistician Sir Austin Bradford Hill in 1965 which are designed to provide evidence of a causal relationship between two variables.

1. Strength: The larger the association between two variables, the more likely that it is causal.

2. Consistency: Consistent findings observed by different researchers in different locations and with different samples increases the chances that an association is causal.

3. Specificity: Causation is likely if there is a very specific population at a specific site and disease with no other likely explanation.

4. Temporality: The effect has to occur after the cause.

5. Biological gradient: Greater exposure should generally lead to greater incidence of the effect.

6. Plausibility: A plausible mechanism between cause and effect is helpful.

7. Coherence: Coherence between epidemiological and laboratory findings increases the likelihood of an effect.

8. Experiment: Experimental evidence increases the chances that a relationship is causal since other variables can be controlled for during experiments.

9. Analogy: The use of analogies or similarities between the observed association and any other associations can increase the chances of a causal relationship being present.

By using these nine criteria, you can increase the chances that you're able to correctly identify a cause-and-effect relationship between two variables.