# Fallacies of Weak Induction

**Fallacies of weak induction** are weak inductive arguments in which the premises are evidentially relevant to the conclusion (unlike fallacies of relevance), but are not strong enough to justify belief in the conclusion without being supported by additional premises. Any argument that commits a fallacy of weak induction is (unsurprisingly) a weak inductive argument. These fallacies are often related to the phenomenon of **confirmation bias**, which occurs when a person overestimates the strength of evidence that supports existing beliefs and underestimates the strength of evidence that goes against them.

In this lesson, we’ll be examining the structure of several different fallacies of weak induction, as well as what separates these fallacious argument from stronger arguments of the same type. The fallacies we will address include hasty generalization, several different varieties of the “false cause” fallacy, appeal to unqualified authority, and weak induction.

## Hasty Generalizations and Anecdotal Evidence

A generalization is a common form of inductive argument that involves drawing conclusion about populations from evidence concerning samples. One general form is as follows:

* Premise: In a sample S, X% of those studied have trait T.
* Conclusion: In the population P as a whole, around X% of everyone has trait T.

Such arguments are always inductive, and they can be either strong/weak or cogent/uncogent. The fallacy of **hasty generalization** fallacy occurs only when the sample that one has chosen is NOT likely to be representative of the population as a whole. This might be simply because the sample is small, or it might be because the sample has been chosen using a biased procedure of some type. For example, it’s almost always a bad idea to draw conclusions about large groups based on “things that happened to me” or “stories about individuals I read/watched.” Some examples of this fallacy include:

* “A poll of 1,000 likely college students shows that a majority support legalizing marijuana. So, a referendum in favor of legalizing marijuana is likely to succeed.” [Problem: This is a biased sample, since not all voters are college students.]
* “Mark Maguire, Sammy Sosa, and Barry Bonds only hit over 50 home runs in a season because they cheated. It must be that anyone who hits over 50 home runs in a season is cheating.” [Problem: This is a small sample. Also, these players all played baseball around the same time, and it could be that steroids were more common during this era than in other times.]
* “My friend had his cheese sandwich stolen by two teens wearing Green Bay Packers jerseys. So, most Green Bay Packers fans must be criminals.” [Again, a small and biased sample.]

As the last example shows, hasty generalizations often occur when too much weight is given to **anecdotal evidence** concerning a small number of cases (often, the arguer’s own personal experience, the experience of his acquaintances, or things he’s read/seen on TV or the internet). And while this example might be a silly one, bad inferences of this type seem to play a significant role in maintaining racist, sexist, religious, etc. **stereotypes**, since people can almost find *some* story that seems to provide support for their view. The problem here is that stories about individuals (even exciting and memorable ones! And even ones that happened to you!) are not actually very good evidence about what holds of populations in general.

## Fallacies About Causation

Another form of inductive argument involves drawing conclusions about causes and effects. As with generalizations, such arguments play a huge role in our day-to-day lives, and they can be strong or weak, cogent or uncogent. The fallacy of **false cause** occurs when the premises fail to support the existence of a causal connection that the conclusion depends on. Logicians have discovered many different forms of this fallacy, several of which have been given formal names. As was the case with hasty generalizations, it isn’t always obvious to the casual onlooker whether these fallacies have been committed, since these informal fallacies appear superficially similar to good arguments. However, to someone who knows something about the *content* of the argument, the problem should be obvious.

|  |  |  |
| --- | --- | --- |
| Form | Example | Problem |
| X causally contributed to Y. So, X is the sole or most important cause of Y. | “The southern states’ desire to have their own flag made some causal contributor to their decision to secede from the U.S. So, these states’ decision to secede had nothing do with slavery.” | Events often have multiple causes, and not all causes are equally important. It’s almost always illegitimate to assume that just because you’ve found ONE cause of something there can’t be other causes as well. |
| **Post hoc ergo propter hoc.** Y happened after X happened. So, Y happened because of X. | “Aunt Edna took aspirin right before she died. So, her taking aspirin must have caused her death.” | In general, the fact that X happened before Y only very weakly supports the claim that X caused Y. Much more evidence is needed to establish the connection between X and Y. |
| **Non causa pro causa** (“not the cause for the cause”). X and Y are correlated. So, changing the value of X will change the value of Y. | “People who spend lots of time in the hospital often die young. So, we could increase human life expectancy by closing hospitals.” | While it’s true that correlation between two things (hospitals and life expectancy) usually means there is *some* causal link between them, it doesn’t mean it is a simple case of one causing the other. (In many cases, there is some other factor which causes them both.). |
| **Gambler’s fallacy.** Y happens X% of the time. In the recent past, Y has happened <X% of the time. So, Y is likely to happen next time. | A fair coin came up heads six times in a row. Therefore, it is very likely to come up tails next time. [The chance of tails is always 50%] | This is called the “gambler’s fallacy,” since it often takes the form “I’ve been losing so much that I’m due for a win—I’d better keep playing!” The problem is that, in most games of chance, the chance of winning/losing never changes, since each instance of the game is *independent.* |
| **Slippery slope:** “If A happens, then B, C, D,…, and Z will happen. Since Z is unacceptable, so is A.” | “If we allow the military to torture known enemy combatants, then we must allow them to torture suspected terrorists, then rude foreign civilians, and finally innocent American children. So, we must ban torture. “ | Slippery slopes become weaker with (a) more steps and (b) weaker causal connections between individual steps. The longer and more gradual the slope is, the less likely we are to “slide down it.” |

## Other Fallacies Of Weak Induction

**Suppressed Evidence.** Inductive arguments, unlike deductive arguments, can be strengthened or weakened by the addition of new premises. The fallacy of **suppressed evidence** occurs when a premise is left out that the arguer knows (or should know) would substantially weaken an inductive argument.

* Tylenol is easier on your stomach than Advil. [No benefits of taking Advil are mentioned.] Therefore, you should always take Tylenol for aches and pains.
* No woman has ever been president of the United States. [Nothing is mentioned about the changes in society over the last few hundred years.] Therefore, no woman will ever become president of the United States.

**Appeal to Ignorance:** “Because C has not been (deductively) proven false, C is reasonable to believe.” This fallacy often occurs because of an inappropriate demand for deductive proof. Many false statements (“Unicorns exist”, “Elvis is currently living in Minneapolis”) cannot be proven false. This does not mean that such statements are reasonable to believe.

* Because we cannot prove that giving money to Oxfam helps feed starving children in Africa, it’s probably the case that giving money to Oxfam is a complete waste of your money.
* Because we cannot prove that atomic nuclei are composed of protons and neutrons, we must also admit the possibility that they are made of cotton candy.

**Appeal to Unqualified or Inappropriate Authority.** In an appeal to unqualified authority, a conclusion is supported by citing an authority that lacks expertise, is biased, or is otherwise unreliable. Qualified authorities should be unbiased subject matter experts. In some cases, a separate argument might be needed to establish the authority’s credentials. If two equally qualified authorities disagree about the truth of the conclusion, the premises must also acknowledge this. To do otherwise would be to suppress evidence.

* My cousin Bonnie is an expert hunter, and she claims that gun ownership makes people better, more responsible citizens.
* My other cousin Brad lost a child to a gun accident. He claims society would be safer if we banned private ownership of guns.
* The “Americans in Favor of Guns’ Rights” website claims that universal ownership of handguns would lower the crime rate by 60%. So, adopting this sort of legislation would probably lower the crime rate by 60%.
* The “Americans for Gun Control Website” claims banning handguns would cut suicide rates by 60%. So…(you get the point).

*Note:* The take-away here is not “we should just ignore data” or “you should just believe whatever you want, since you can always find an expert to agree with you.” Instead, the lesson is to pay attention to what the *consensus* of disinterred experts on a subject say about some topic. In many cases, this can be really easy to find (e.g., most textbooks provide this sort of info.). In highly charged political issues, it might be much more difficult (and in these cases, it might be best to use other forms of inductive reasons besides arguments from authority). Finally, when reviewing claims from interested groups, you shouldn’t dismiss entirely them. Instead, take a look at what the “other side” might say, where each side has obtained its data, etc.).

## Arguments from Analogy

An **argument from analogy** is an inductive argument that depends on a claim of similarity. It has the general form “Objects X1, X2, and X3 have properties A, B, C. Object X4 has properties A and B. So, X4 probably has C as well.” The strength of an argument from analogy depends on:

1. The number and diversity of primary analogues (X1, X2, X3).
2. The number and relevance of the shared properties (A, B, C).
3. The number and relevance of any *disanalogies* between the objects mentioned in the premise and the object mentioned in the conclusion.
4. The strength of the conclusion. All other things being equal, an argument with a conclusion that makes a strong claim is *weaker* than an argument whose conclusion is weaker. This holds for all inductive arguments.

**Analogies in Moral Arguments.** Arguments from analogy often play a central role in moral and legal reasoning:

* Adult human beings with severe cognitive disabilities are capable of feeling pain, and it is wrong to kill them. So, it is wrong to kill animals with similar cognitive capacities that are capable of feeling pain.
* Adult human beings with severe cognitive disabilities are capable of feeling pain, and it is wrong to kill them. So, it is wrong to kill human fetuses with similar cognitive capacities that are capable of feeling pain.

In both arguments, we go from generally accepted moral facts (about the immorality of killing adult humans with disabilities) to often-disputed moral conclusions (about killing animals or fetuses). In order to *criticize* these arguments, you can (1) point out dissimilarities between the cases, (2) point other primary analogues.

**Weak Analogies (Fallacy).** A weak analogy is a fallacious argument from analogy. Analogies are weak to the degree they do not meet the criteria just mentioned. The strength of an argument from analogy directly varies with how similar the cases mentioned in the premises are to the case mentioned in the conclusion. Also, remember not to suppress evidence—a cogent argument from analogy should not leave out information that would significantly weaken the argument.

* Children often enjoy having small domestic cats as pets. So, since tigers are the same species as domestic cats, children would also enjoy keeping baby tigers as pets.
* LeBron James is tall, and is very good at basketball. I am very tall. Therefore, I would be very good at basekball.

## Solved Problems

Determine which fallacy, if any, is committed by the following passages. In these problems, I’ve focused on diet-related claims, which often involve these sorts of fallacies. The point here is NOT that any of these diets is particularly good or bad (that’s beyond the scope of a logic class!), but instead to think about what it means to provide *good evidence* for these sorts of (inductive) claims.

|  |  |
| --- | --- |
| Passage | Analysis |
| Dr. Oz says that I can lose weight by eating garcinia extract. Since he’s a doctor, I should do what he says. | Appeal to Inappropriate Authority**.** While Dr. Oz may be a doctor, he isn’t the *only* doctor, and his opinion hardly represents a consensus of experts. If you wanted to know what to think of this claim, you’d want to do some research, and see what the \*consensus\* view was on this. (In the case of nutrition, the scientific consensus is usually reflected in publications by government agencies like the Food and Drug Administration, major medical institutions like Mayo Clinic or Cleveland Clinic, and by diet recommendations of groups like the American Heart Institute.) |
| Six weeks ago, I cut gluten (or meat, or milk, or whatever) from my diet, and look how much weight I’ve lost, and how much better I feel. I can only conclude that [specific food item x] was the cause of my weight gain or ill health. | False Cause (non causa pro causa/post ergo propter hoc). The case of diets provides an especially clear example of how this fallacy. It can seem *obvious* to people that the most recent diet they’ve engaged in was “the cause” of their weight loss. However, this almost always an unjustified conclusion, since there is almost things happening *besides* merely cutting out this food item that might bear a causal relationship to the weight loss (for example, people might just be eating less food, or have changed their exercise habits, etc.). This is why things like scientific studies are so important. |
| I lost 10 pounds in the first two months of my diet. So, I can reasonably expect to lose 50 pounds over the next 10 months. | Hasty Generalization. The first two months of a new diet are \*not\* an unbiased sample of what the future days will look like. In the vast majority of cases, people will put on much of the weight they’ve lost. |
| In a study of mice, a group of mice that was forced to fast for 12 hours a day lived 20% longer than mice that ate all. [Implicit: humans are mice are similar in that they are mammals, etc.] Therefore, I could extend my life span by 20% by fasting for 12 hours a day. | Weak Analogy. The weak analogy here is between mice and humans. The problem is not that we can’t learn *anything* from studying mice (we can!), but instead that it’s unlikely that an individual human will respond in exactly the same way the mice do (as this argument claims). This argument ignores these differences between humans and mice, and then proceeds to make a *very* strong claim about what will happen to a certain human. If the conclusion were weaker (“it might improve my health to take a break from eating now and again”) the argument itself would be stronger. |
| My physician said that my cholesterol was very high, and that I should consider changing my diet. I talked to a nutritionist who agreed. Both of them told me I should consider following the “DASH diet.” So, my health will improve if I do this. | No fallacy. Note that, because of the inductive nature of this argument, you still might be wrong about the conclusion! And it may well be that new evidence will eventually cause you to revisit this conclusion. However, it is nevertheless *reasonable* to act on this sort of evidence (expert advice rooted in scientific consensus). |
| There’s lots of scientific disagreement about diets, and no one has conclusively shown what the best diet is. So, who are you to say that my diet of “eat all the doughnuts, all the time” is a bad one? | Appeal to Ignorance. It’s true that there are many questions about nutrition (and with science generally) that are unsolved. It’s also true that there’s no way of mathematically providing that any given crazy diet idea won’t work. However, this does NOT mean that the evidence supports this crazy diet, or that there aren’t diets that are better or worse supported by the evidence. |
| Lots of people I’ve talked to said they lost weight after stopping eating food item F. I also read many stories of people on the internet who did the same thing. Clearly, everyone could lose weight by doing this. | Hasty Generalization. For any given popular diet (including many which are completely at odds with one another), you can almost *certainly* find lots of anecdotal evidence to support it, via the testimony of friends, social media, news stories, your own experience, etc. However, gathering data in this way is highly biased (since you are almost certain to encounter many more stories of successes than failures.). |
| I saw a news article about a scientific study that provided some support for diet X. Hence, that diet is clearly the way to go! | Suppressed Evidence. As is the case with many other issues, there are a LOT of studies on nutrition. While new studies are clearly relevant, it is fallacious to ignore/suppress evidence against diet X in making a decision. |
| Diets A, B, and C have all failed me. This just means that diet D is all the more likely to work! | Gambler’s fallacy. There’s no particular reason to think that failing on one diet makes another’s succeeding any more likely. |
|  |  |

## Review Questions

1. Give an example of a phenomenon (from the news, movies, or your own life) that you think illustrates *confirmation bias.*
2. Give ONE example of each of the fallacies we’ve discussed in this class (be creative)!