

Chapter 6 Causal Analysis, 6th ed

ANSWERS

A. Match the causal claims in List 2 with the causal concepts in List 1 that seems best to capture their meaning.

- a., 2
- b., 1
- c., 6
- d., 1 (when hair loss is due to vitamin deficiency, it can be restored by taking vitamins, so 4 may be appropriate.)
- e., 5
- f., 4
- g., 4
- h., 3

B.

1. d. The proximate cause or triggering condition.
2. a. It was necessary for the voyage he made.
3. a. Necessary condition. The claim may be false, unless "freedom" is understood in some special way.
4. f. and d. Oxygen and water are standing conditions, and the truck's crossing the bridge was the proximate cause.
5. e. The icing may have been the proximate cause. One might say that the ice on the wings (plus the standing conditions) was a sufficient condition.
6. b. Sufficient.
7. b. "One of the causes" is usually understood as sufficient condition (one of several). For example, viral infection is also "one of the causes" of fever. (Strictly, of course, either kind of infection is only one of the factors that combines with others to constitute a set of factors that is sufficient for fever.)
8. e. It's a contributing condition we can usually do something about, which makes it a controllable condition.
9. e. and f. It was a factor Hitler controlled, and from the historian's standpoint, it was a standing conditions for some events.
10. c. Necessary condition.
11. b. Sufficient condition. Earthquakes may also result from volcanic activity and land subsidence, so plate activity is not a necessary condition.
12. The analysis can be phrased in different ways. At least half your blood is necessary for life (a.); lose half your blood and you die (that is b., the loss is sufficient condition for death.)
13. e. Controllable conditions. One might say they are contributing conditions (g.), but missing the controllable aspect shows a lack of attention.
14. d. Triggering condition (a paradigm case).
15. c. Necessary and sufficient.

C. In these cases, the order of the sentences is not important. What is important is seeing how the generalizations relate the events needing explanation to the background conditions.

1. **Event:** The stick looks bent.

b. When light strikes an object, it is reflected from the object's surface.

a. Light travels in straight lines.

d. Light reflected from the part of the stick in the air travels a straight line.

e. Light reflected from the part of the stick below the water emerges at a different angle.

c. We see objects when light reflected from them enter our eyes.

f. Light rays from the two segments enter our eyes at different angles.

g. Thus, the stick looks bent.

i. Thus, some metal (the unprotected steel) parts of Don's bike are rusty (have iron oxide on their surfaces).

2. Why did Carl get sick from the flu?

Event: Carl gets the flu.

c. The flu virus is spread by infecting people by personal contact.

e. Carl went to dinner with Lisa (i.e. had personal contact with Lisa).

a. Lisa has the flu.

f. Lisa infected Carl with the flu virus.

b. Anyone with a compromised immune system infected with the flu virus gets the flu.

d. Carl takes immunosuppressive drugs for his kidney transplant and so has a compromised immune system.

g. Thus, Carl gets the flu.

D.

1. Out of gas.

a. All internal combustion engines require combustible fuel to start; b. My car has an internal combustion engine; c. The fuel tank of my car contained no combustible fuel. Thus, my car failed to start.

2. Wet spark plugs.

a. All internal combustion engines require a heat source to ignite the fuel in the combustion chamber; b. In contemporary cars, this is supplied by an electrical spark arcing between the poles of a spark plug; c. Wet plugs do not arc; d. Your car has an internal combustion engine; e. Your car is contemporary; f. Your spark plugs were wet. Thus, the fuel in the combustion chamber did not ignite.

Similar explanations can be constructed on the same model for: 1. the battery is dead; 2. the fuel line is clogged; 3. the starter is bad and doesn't turn over the engine; 4. the battery cables are corroded and don't allow electricity to flow to the starter; 5. the air on the mountain top where you are lacks sufficient air to support combustion. Of course many other explanations are possible, depending on your car and your circumstances.

F. Discuss the methods of experimental investigation illustrated in the cases below. (The investigation need not have led to a conclusion we now accept as true.) Address the questions specific to each case.

1. The authors of the study appear to have confused correlation with causation. Indeed, they appear to have reversed the causal order. If the

criminal justice system is working, we would expect the prison population to increase, if the crime rate is increasing. (This is not to say that a feedback loop couldn't be possible. That is, as people learn to be better criminals in prison, then get out and commit more crimes.)

2. The method of difference suggests that the air (or something in it) is responsible for the growth of microorganisms:

Broth in sealed flask: no microorganisms.

Broth in unsealed flask: microorganisms.

The only factor different in these cases is whether the flask is sealed (open to the air) or unsealed (closed to the air).

When these two cases are compared with the earlier case of the broth in the uncovered flask, the method of agreement (air exposure, microbes) and difference (no air exposure, no microbes) points in the same direction. contemporary; f. Your spark plugs were wet. Thus, the fuel in the combustion E.

1. A is the cause. Method of agreement.
2. C is the cause. Method of difference.
3. B is the cause. Method of agreement and difference.

4. You have two battery operated, bulb-type flashlights. One works, the other doesn't. You switch batteries. The flashlight that worked no longer does, and the one that didn't now does. Why is this?

The initial situation:

Case 1: flashlight A, batteries A: Light

Case 2: flashlight B, batteries B: No light

You switch batteries:

Case 3: flashlight A, batteries B: No light

Case 4: flashlight B, batteries A: Light

We get no light in Cases 2 and 3 in which batteries B are used, although Cases 1 and 2 use flashlight A. So through the joint method of agreement and difference, we conclude that batteries B are faulty.

5. Because flashlight B doesn't work, even with batteries A, we need to consider that at least one other factor might be involved. That the bulb of flashlight B is burned out is the most obvious hypothesis. We can test it by using flashlight A and batteries A and comparing the cases in which we switch bulb A for bulb B:

Case 6: Flashlight A, batteries A, bulb A: Light

Case 7: Flashlight A, batteries A, bulb B: No light.

The method of difference identifies bulb B as faulty.

6. Flashlight A does not work because batteries B are bad, even though bulb A is good. Flashlight B does not work because, even though batteries A are good, bulb B is bad.

Case 8: Flashlight A, batteries B, bulb A: No light

Case 9: Flashlight B, batteries A, bulb B: No light

The method of agreement and difference applied to Cases 5-9 identify both batteries B and bulb B as bad.

F.

1. Goldberger reasoned that if pellagra is infectious, injecting or ingesting materials likely to contain the agent will produce the disease. Doing so did not. Thus, by a modus tollens argument, he concluded pellagra was not an infectious disease:

If infectious, can be spread by injection/ingestion. Not spread by

injection/ingestion. Thus, not infectious.

2. Pascal employed (via his brother-in-law) the method of concomitant variation to confirm the hypothesis that there is a "sea of air" surrounding the earth. The weight of the column of air over the open dish of mercury diminishes with increased altitude. As the air gradually grows "thinner," the mercury in the tube that balanced the column of air pressing on the open dish of mercury slowly sinks, because not as much weight is pushing against the mercury.

3. The hypothesis is that micro-RNAs may be a third mechanism by which cancer is caused. The method of difference may represent the causal relationship between cancer and micro-RNAs: cases in which micro-RNAs are highly active are cases in which cancer results, but it doesn't occur in cases in which they are present but not highly active. That is, cancer occurs in S1, but not S2, which is the same as S1, except for the presence of the highly active micro-RNAs. (More of Mill's methods might be used, given more information about cancer.)

4. Needing explanation is the relatively high frequency of cases of lipid disorders among Ashkenazim. The hypothesis is that genes for the disorders must be associated with some evolutionary advantage. The first criticism is that, if this were so, then mutations responsible for the diseases would also be found in European populations, but they are not. (That is, the mutations occur, but they are preserved and don't spread.) Thus, they offer no adaptive advantage. This is a form of *modus tollens* falsification. (If the diseases-- or mutated genes responsible for them-- offered adaptive advantage Europeans would have them. Europeans don't have them. Thus, the diseases don't offer adaptive advantage.)

The second criticism, which is also an alternative explanation, is that the mutated genes have such a high frequency because they are a case of the founder effect-- namely, that the mutated genes were present in the small population of Ashkenazim, then as the population expanded, the genes spread along with other genes. Thus, it's not necessary to ascribe some adaptive advantage to the mutated genes.

5. The alleged relationship is that children treated violently will become violent adults. The prediction is that reducing the amount of violence done to children (child abuse) will result in reducing the amount of violence in society.

G. (a) The lawyer might be expected to sue the architectural engineer for not designing the house so that it was supported on bedrock and the builder for not extending the supports to bedrock, arguing that it was just these design and building flaws that caused the destruction of the house; the lawyer might also be expected to sue the insurance company, if it holds that the destruction was an "act of God" and refuses to pay; the lawyer might argue that rain-- even heavy rain continuing for several days-- is an ordinary event, not an extraordinary one like a earthquake or tsunami, and that the rain was the cause of the mud slide and of the house's destruction; (b) (c) the designer and building contractor might argue that the house was neither designed nor built to stand up to all conditions, and that the extraordinary heavy rain caused the house's destruction; (d) the insurance company might agree with the designer and the contractor that the house was designed and built properly and was destroyed only because of what amounted to a cataclysmic event-- the extraordinarily heavy and persistent rain.

[end]