Causation and Observational Studies: Other Pitfalls

Learning Objective: Explain how the study design impacts the types of conclusions that can be drawn.

Observational studies are subject to other pitfalls besides lurking variables, arising from various aspects of the design for evaluating the explanatory and response values. The next pair of examples illustrates some other difficulties that may arise.

Example

Suppose researchers want to determine if people tend to snack more while they watch TV. One possible design that we considered was to recruit participants for an observational study, and give them journals to record their hourly activities the following day, including TV watched and snacks consumed. Then they could review the journals to determine if snack consumption was higher during TV times.

We identified this as a prospective observational study, carried forward in time. Studying people in the more natural setting of their own homes makes the study more realistic than a contrived experimental setting. Still, when people are obliged to record their behavior as it occurs, they may be too self-conscious to act naturally. They may want to avoid embarrassment and so they may cut back on their TV viewing, or their snack consumption, or the combination of the two.

Example

Yet another possible design is to recruit participants for a retrospective observational study. Ask them to recall, for each hour of the previous day, whether they were watching TV, and what snacks they consumed each hour. Determine if food consumption was higher during the TV times.

This design has the advantage of not disturbing people's natural behavior in terms of TV viewing or snacking. It has the disadvantage of relying on people's memories to record those variables' values from the day before. But one day is a relatively short period of time to remember such details, and as long as people are willing to be honest, the results of this study could be fairly reliable. The issue of eliciting honest responses will be addressed in our discussion of sample surveys.

By now you should have an idea of how difficult—or perhaps even impossible—it is to establish causation in an observational study, especially due to the problem of lurking variables. The key to establishing causation is to rule out the possibility of any lurking variable, or in other words, to ensure that individuals differ **only with respect to the values of the explanatory variable**. In general, this is a goal which we have a much better chance of accomplishing by carrying out a well-designed experiment.
