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Wrap-Up (Designing Studies)

In this section we distinguished among different types of studies and learned the details of each type of study design. By doing so, we also expanded our understanding of the issue of establishing causation that was first discussed in the previous unit of the course. In the Exploratory Data Analysis unit, we learned that in general, association does not imply causation, due to the fact that lurking variables might be responsible for the association we observe, which means we cannot establish that there is a causal relationship between our "explanatory" variable and our response variable.

In this section we completed the causation puzzle by learning under what circumstances an observed association between variables CAN be interpreted as causation. We saw that in observational studies, the best we can do is to control for what we think might be potential lurking variables, but we can never be sure that there aren't any others that we didn't anticipate. Therefore, we can come closer to establishing causation, but never really establish it.

The only way we can, at least in theory, eliminate the effect of (or control for) ALL lurking variables is by conducting a randomized control experiment, in which subjects are randomly assigned to one of the treatment groups. Only in this case can we interpret an observed association as causation. Obviously, due to ethical or other practical reasons, not every study can be conducted as a randomized experiment. Where possible, however, a double-blind randomized control experiment is about the best study design we can use.

Another very common study design is the survey. While a survey is a special kind of observational study, it really is treated as a separate design, since it is so common and is the type of study that the general public is most often exposed to (polls). It is important that we be aware of the fact that the wording, ordering, or type of questions asked in a poll could have a impact on the response. In order for a survey's results to be reliable, these issues should be carefully considered when the survey is designed.

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