

I. Objectives:

- Review causal inference concepts and assumptions
- Introduce directed acyclic graphs

The material below is based on the text of the Part I of the working book, Causal Inference, by Drs. Miguel Hernan and James Robins. The full text is currently available from:
<http://www.hsph.harvard.edu/miguel-hernan/causal-inference-book/>.

II. Association versus Causation:

How do we show association using probability notation?

How do we show causation using probability notation?

What is an individual causal effect?

What is an average causal effect?

Which assumptions must be made in order to determine average causal effects? Are these expected to hold in randomized and observational studies?

How does association differ from causation?

III. Causal DAGs:

What are causal DAGs?

What's in the name?

How are DAGs drawn?

What do common causes imply?

What do common effects imply?

How do you condition on a variable?

When is a path blocked?

When is a path open?

IV. Questions for in-class break-out exercise (use these to guide your reading of assigned articles):

1. Briefly describe the study hypothesis and the population of interest. What was the major exposure and outcome of interest? Summarize the main findings.
2. Draw a directed acyclical graph (DAG) representing the hypothesized relationship between the exposure and outcome, including all potential variables included in the description of study methods and analysis. Be sure to label your variables.
3. Could you think of other potential confounding variables that have not been considered by the authors? Are there any unmeasured common causes of the exposure and outcome that may have been omitted?
4. Did the authors control for any potential mediator variables? How might this affect the findings of the study?
5. Use the DAG from question #2 to show whether there any other potential sources of bias in this study.

Consider the following DAGs:

What do you conclude about A and Y?

