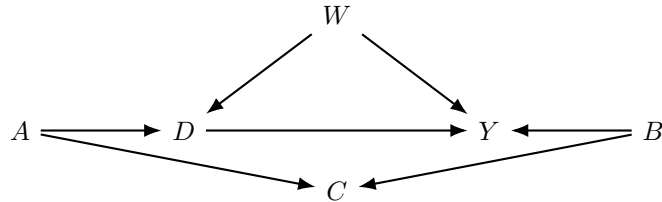


Introduction to Causal Inference

Academia Sinica ISSM — Day 2, Worksheet 1: Reading DAGs

Name: _____

Consider the DAG below. All variables are observed. D is treatment, Y is the outcome.



Question 1: Find the backdoor paths

List every backdoor path from D to Y (any path that starts with an arrow *into* D and ends with an arrow into Y).

Question 2: Which sets satisfy the backdoor criterion?

For each candidate adjustment set, say whether it satisfies the backdoor criterion for the effect of D on Y , and why. (Hint: use the paths from Q1.)

(a) $X = \{W\}$

(b) $X = \{W, C\}$

(c) $X = \{W, A\}$

(d) $X = \{W, A, C\}$

(e) $X = \{W, B, C\}$

Which of these is the best and why?

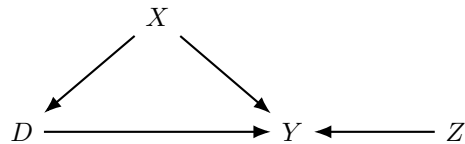
Question 3: Translate backdoor into CI

Suppose I give you a set X that *does* satisfy the backdoor criterion. What conditional-independence assumption does that imply? Write it in terms of D , $Y(d)$, and X .

In one or two sentences: how does the backdoor criterion relate to the different *reasons* D and Y can be associated, and to making a claim about the effect of D on Y ?

Question 4: An experiment changes the graph

A *different* study. Here X is a common cause of D and Y , and Z affects *only* Y :



- (a) As drawn, what must you adjust for to identify the effect of D on Y ? Is Z needed?
- (b) You now learn D was *randomly assigned* (an experiment). What changes on the graph? Redraw it.
- (c) In the experiment, what must you adjust for to identify the effect?
- (d) You still want the most *precise* estimate. Which variable(s) could you adjust for to reduce *noise* (not bias), and why?