

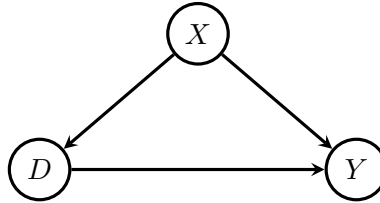
Statistics 256: Causality

In-class Activity 2: Interventions and the Backdoor Criterion

Name(s): _____

Question 1: Seeing vs. doing

Consider the following DAG, where D is a treatment and Y is an outcome:



(a) Draw the interventional (mutilated) graph G_m corresponding to $do(D = d)$.

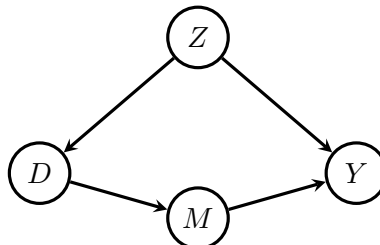
(b) In G_m , does X still influence D ? Does X still influence Y ? Briefly explain.

(c) Why does $P(Y \mid D = d) \neq P(Y \mid do(D = d))$ in general for this graph?

Question 2: Finding backdoor adjustment sets

For each DAG below, identify the effect of D on Y . List all backdoor paths, then determine which sets of observed variables (if any) satisfy the backdoor criterion. All non-dashed nodes are observed.

(a)

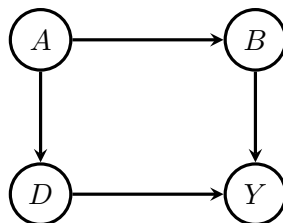


Backdoor paths:

Valid adjustment set(s):

Would conditioning on $\{M\}$ work (identify the effect of D on Y)? Why or why not?

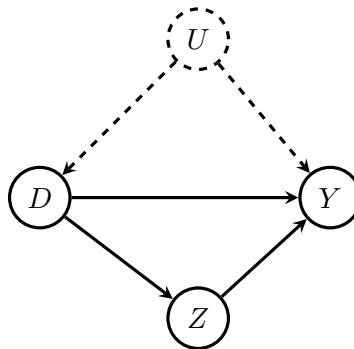
(b)



Backdoor paths:

Valid adjustment set(s) — find as many as you can:

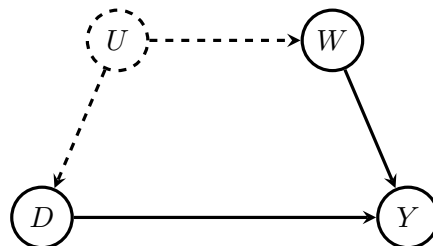
(c)



Backdoor paths:

Can you find a valid adjustment set among the observed variables? Explain.

(d)

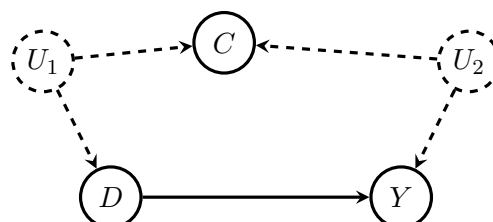


Backdoor paths:

Does $\{W\}$ satisfy the backdoor criterion? What about the empty set?

Question 3: Conditioning gone wrong

Consider the following DAG (U_1 and U_2 are unobserved):



- (a) List all paths between D and Y (ignoring arrow direction). For each, state whether it is open or blocked and why.

- (b) Does the empty set $\{\}$ satisfy the backdoor criterion? Explain.

- (c) A colleague suggests conditioning on C “to be safe.” What happens if you do?

- (d) What is the general lesson here about including extra variables in your adjustment set?