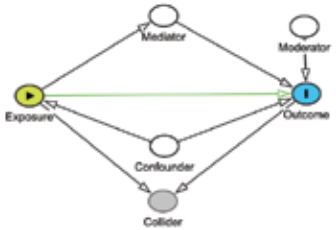
Directed Acyclic Graphs

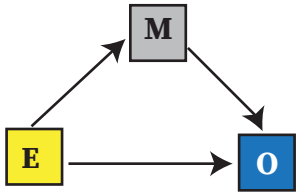
Visual representation of assumed relationships between variables

Define a clear causal question!



- To promote understanding and communication
- To focus research project
- To recognize sources of bias (selection, loss-of follow-up, measurement error)
- To inform statistical analysis

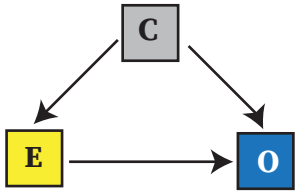
Mediator



E = exposure
O = outcome
M= mediator

Example: Opioids (=M) are given after surgery (=E) and may affect complications (=O)

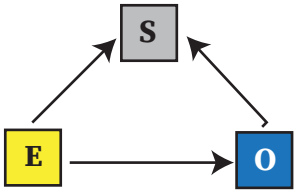
Confounder



E = exposure
O = outcome
C= confounder

Example: Age (=C) is associated with treatment of blood pressure medications (=E) and with hypertension (=O)

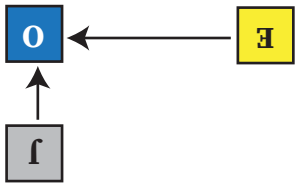
Collider



E = exposure
O = outcome
S= collider

Example: High training volume (=S) is affected by age (=E) and sports injury (=O)

Moderator



Example: Years of experience (=E) is associated with salary level (= O). This association is moderated by sex (=J).

Descendent

E = exposure
O = outcome
I = instrumental variable
Z = descendent

Example: Randomization to a treatment group (=I) effects the treatment (=E) but not the outcome. One-year follow-up (=Z) is a descendent of discharge from physical therapy (=O) after knee replacement (=E)

Marianne Huebner

2025-06-02

cstat.msu.edu

CSTAT
Center for Statistical Training & Consulting

Roles of Variables

STATS DOC