Observational Studies vs. Experiments

Observational studies:

- Observe variables, but do not influence them
- Does not require explanatory/response distinction
- Vulnerable to confounding variables

Experiments:

- Control the value of one or more explanatory variables (e.g. drug dosages)
- If well designed, can provide evidence for causation

Association vs. Causation

It is important to remember: association does not necessarily mean causation

- Association may be coincidence
- There may be another variable that explains the relationship (confounding variable)

What we are trying to avoid:

- Anecdotal evidence: haphazardly rather than systematically collected
  - "My grandpa smokes three packs a day, and he's healthy!"
- Sampling bias: poor methods produce a sample that is not representative of the population
- Observer bias: selecting only samples that seem to support your preferred conclusion

Sampling bias

Sampling problem	May result in bias because:
Non-response/undercoverage	Systematically under-represents certain groups
Voluntary response	May over-select extreme cases/opinions
Convenience sample	Are nearby, have similar jobs, etc.