

Examples of Confounding Focussing on the Timing of Measured Confounders

Simple Application of Elementary Rules for Confounding Control

Bias	Confounding	Address with variable timing
1 Common cause: common cause creates association absent causation.		
2 Mediator bias: conditioning on a mediator biases total effect.		
3 Collider: conditioning on a common effect creates association absent causation.		
4 Collider by descent: conditioning on child of collider induces confounding-by-proxy.		

More Complicated Scenarios

Bias	Confounding	Options
5 M-bias: over-conditioning bias: do not condition on L .		
6 Unmeasured common cause: conditioning on a measured proxy of unmeasured common cause enables creative confounding control.		
7 Unmeasured common cause: condition on baseline treatment and outcome to reduce unmeasured confounding and assess the incident effect.		

A denotes the treatment; Y denotes the outcome; U denotes an unmeasured confounder; L denotes a confounder; \longrightarrow asserts causality; t subscript denotes the true relative timing of the variable; ϕt relative timing is **asserted**, here erroneously; \longrightarrow indicates a path for bias linking A to Y absent causation; \dashrightarrow indicates a path for bias separating A and Y ; L indicates that conditioning on L introduces bias (over-conditioning bias). $U \dashrightarrow Y$ denotes unmeasured confounding, which we nearly always assume exists when treatments have not been randomised. We assess the threat of such confounding after implementing our strongest confounding control strategy by performing sensitivity analyses.

Examples 1-4 demonstrate how incorrect assumptions about variably timing ϕt leads to bias.

Examples 5-7 demonstrate possibilities for confounding that are not solved by longitudinal data collection.