
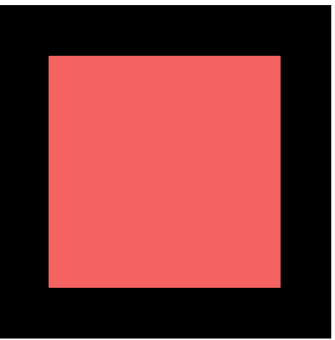
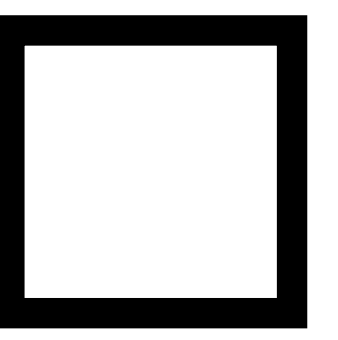
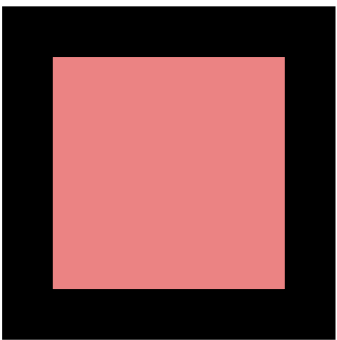

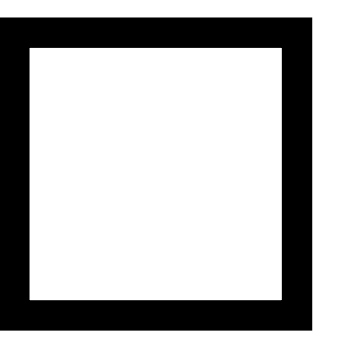
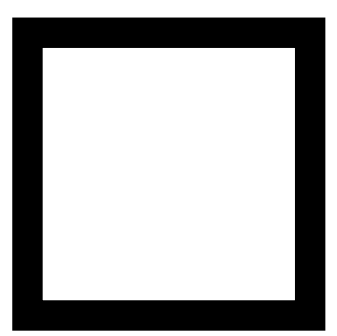
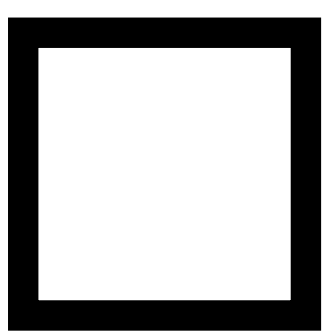
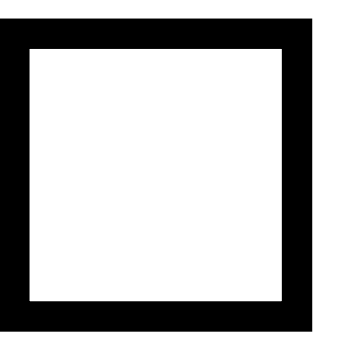
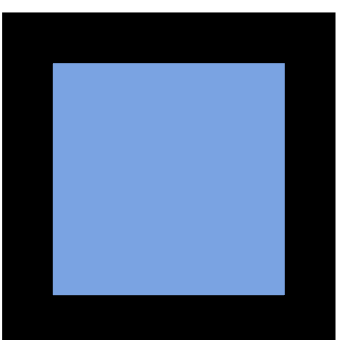
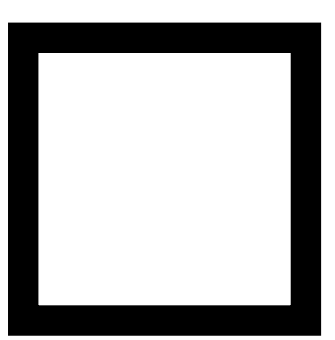
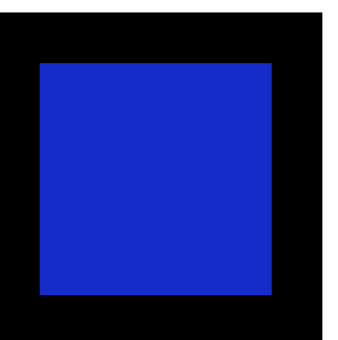
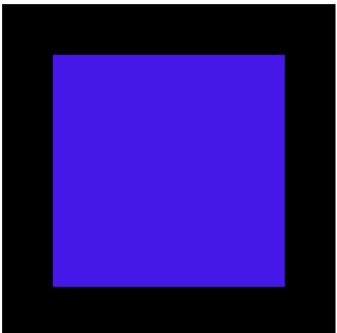

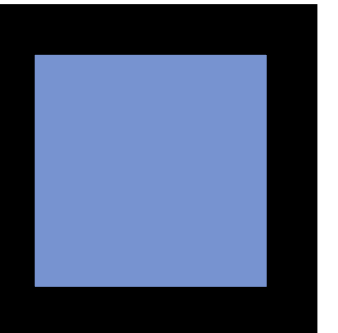
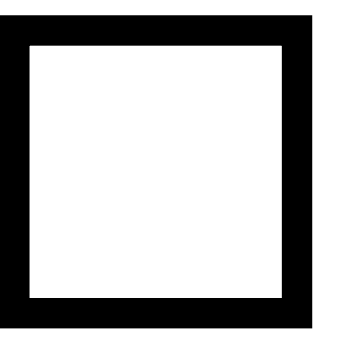
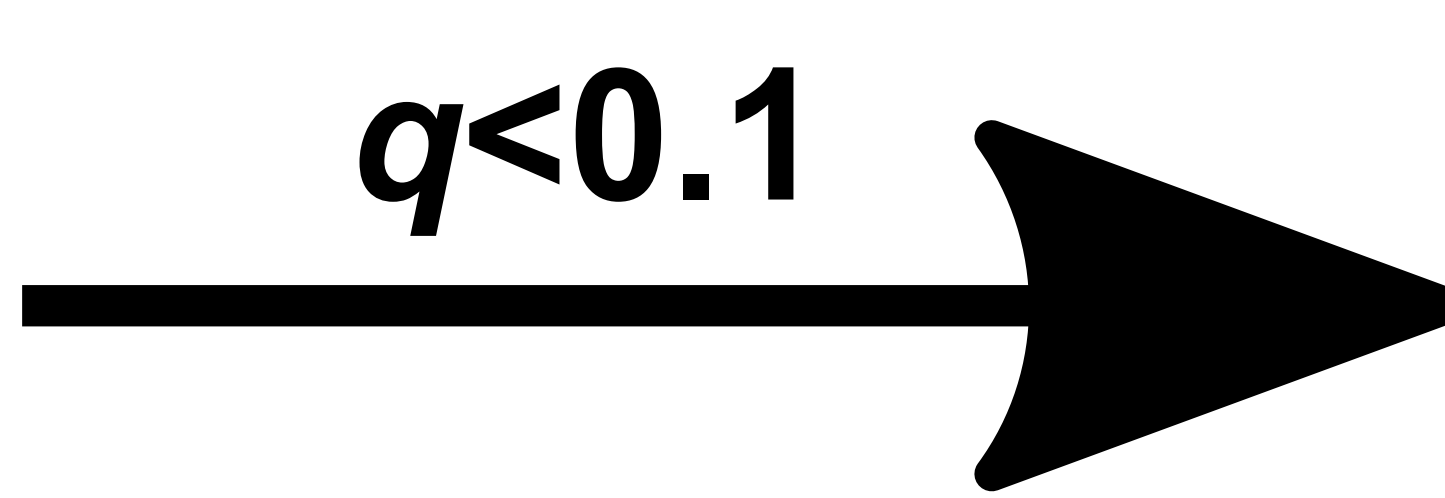


# Naive association testing

between all feature-covariate pairs

features	disease status	covariates		
	D	C <sub>1</sub>	C <sub>2</sub>	... C <sub>n</sub>
	Y <sub>1</sub>			
	Y <sub>2</sub>			
	Y <sub>3</sub>			
	Y <sub>4</sub>			
⋮				
Y <sub>m</sub>				



# Confounder modeling and *post hoc* testing

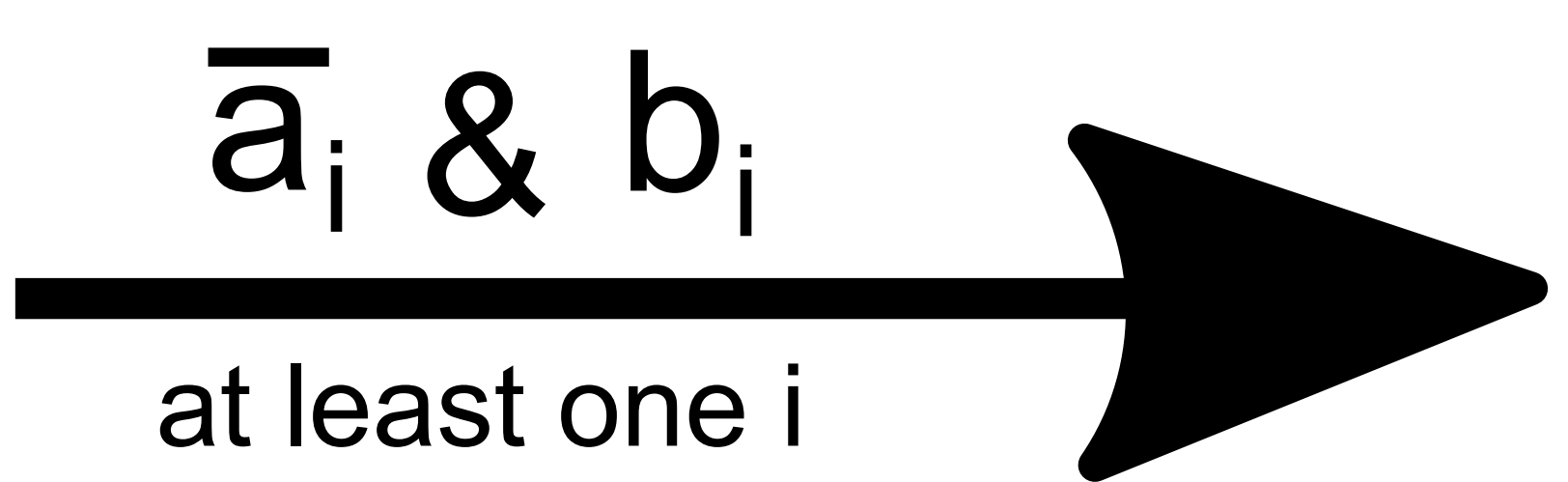
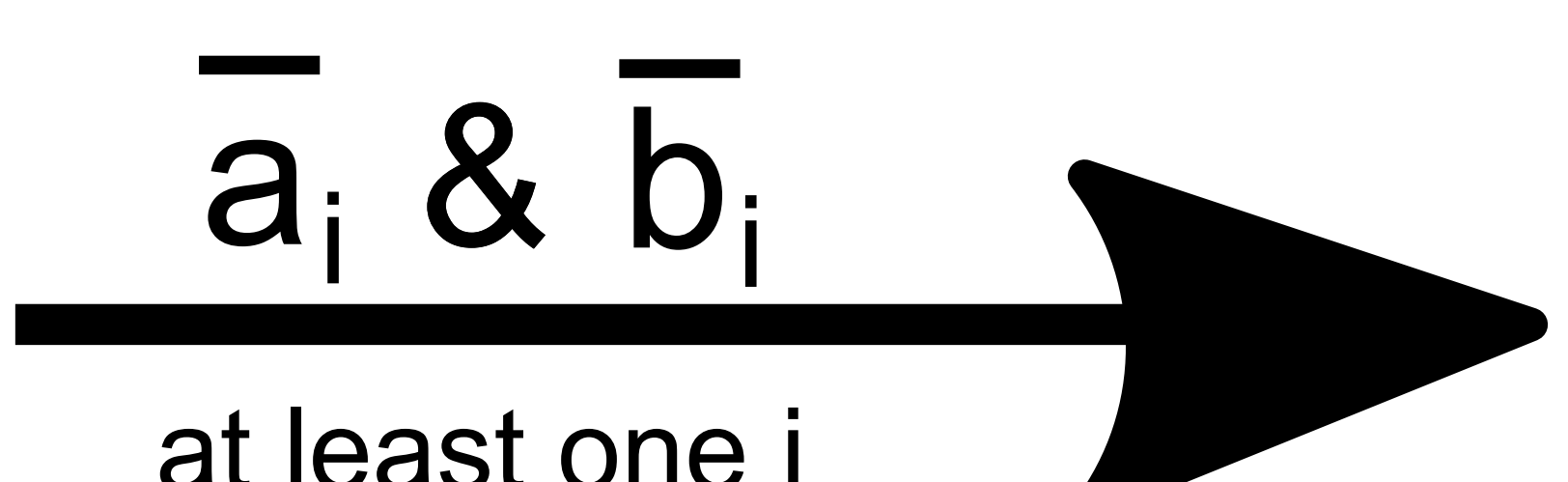
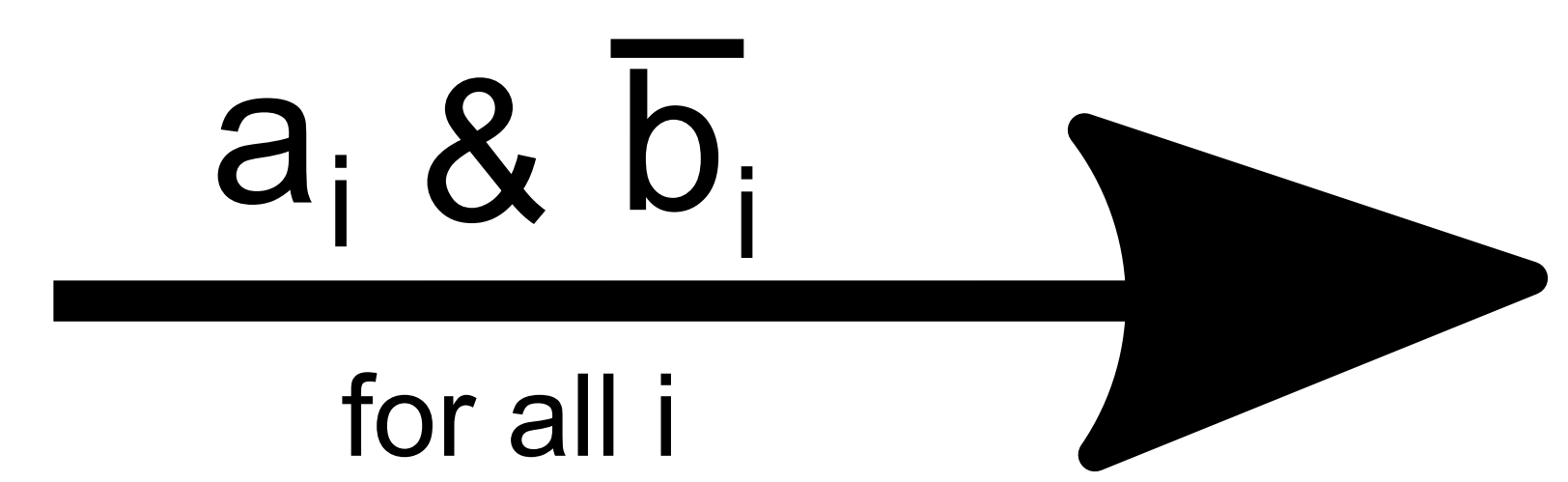
for all significant covariates, C<sub>i</sub>

**a<sub>i</sub>**      Significance of **disease status** beyond that of covariate?

$$\frac{m(Y_1 \sim \textcolor{brown}{D} + C_i)}{m(Y_1 \sim C_i)}$$

**b<sub>i</sub>**      Significance of **covariate** beyond that of disease status?

$$\frac{m(Y_1 \sim D + \textcolor{brown}{C}_i)}{m(Y_1 \sim D)}$$



# Feature status determination

**CONFIDENTLY DECONFOUNDED**  
Disease signal not reducible to any covariate

**AMBIGUOUSLY DECONFOUNDED**  
Disease and covariate signal concurrently lost

**CONFOUNDED**  
Disease signal reducible to at least one covariate