Odds ratio

Odds ratio (OR) calculation

The odds ratio can be calculated by performing a cross product ratio.

	Cases Diseased	Controls Non-diseased
Exposed	A	B
Non-exposed	C	D

Cohort study

$$\frac{AD}{BC}$$

OR

Case-control study

$$\frac{AD}{BC}$$

$$\frac{\text{Odds of disease in exposed}}{\text{Odds of disease in non-exposed}}$$

$$\frac{\text{Odds of exposure in diseased (cases)}}{\text{Odds of exposure in non-diseased (controls)}}$$

OR interpretation

= 1 Risk in exposed = Risk in non-exposed
No association

> 1 Risk in exposed > Risk in non-exposed
Exposure = Risk factor

< 1 Risk in exposed < Risk in non-exposed
Exposure = Protective factor

For the odds ratio to be a valid approximation of the relative risk the disease needs to be rare.

Odds ratio in cohort study

Ratio of odds that exposed developed disease to the odds that non-exposed developed disease

$$\text{Odds of disease in exposed} = \frac{P}{1-P} = \frac{\frac{A}{\cancel{A+B}}}{\frac{B}{\cancel{A+B}}}$$

$$\text{Odds of disease in non-exposed} = \frac{P}{1-P} = \frac{\frac{C}{\cancel{C+D}}}{\frac{D}{\cancel{C+D}}}$$

$$= \frac{A}{B} \cdot \frac{C}{D} = \frac{AD}{BC}$$

Odds ratio in case-control study

Ratio of odds that the cases were exposed to the odds that the controls were exposed

$$\text{Odds of a case being exposed} = \frac{A}{C}$$

$$\text{Odds of a control being exposed} = \frac{B}{D}$$

$$= \frac{A}{C} \cdot \frac{B}{D} = \frac{AD}{BC}$$