

CMED 305 (2018-2019)

Practical Exercise on : Odds ratio & Minimizing Bias (Solutions)

Exercise 1: Data from a case-control study of 198 esophageal cancer cases and 754 community-based controls are shown below in the table. The exposure factor under study is smoking and details of smokers are as shown under. Calculate the odds of risk for the given scenario.

outcome exposure	Esophageal cancer +	Esophageal cancer -	Total
Smokers	96	104	200
Non smokers	102	650	752
Total	198	754	952

$$\text{Odds ratio} = ad/bc = (96 \cdot 650) / (104 \cdot 102) = 62400 / 10608 = 5.88$$

Interpretation: The odds of development of esophageal cancer is 5.9 times higher among smokers than among non smokers.

Exercise 2 : A case control study taking 200 subjects as cases and 400 controls was done to study the effect of tobacco smoke on coronary heart disease. About 112 developed CHD who also smoked and 88 who developed CHD had no exposure to smoking while 176 among the controls smoked but did not develop the disease. Draw a 2*2 table and calculate the odds of risk for the given data.

outcome exposure	CHD +	CHD -	Total
Smokers	112	176	288
Non smokers	88	224	312
Total	200	400	600

$$\text{Odds ratio} = ad/bc = (112 \cdot 224) / (176 \cdot 88) = 25088 / 15488 = 1.6$$

Interpretation: The odds of developing coronary heart disease is 1.6 times higher among smokers than among non smokers.

Example 3: Two classes consisting of 100 students in each class were studied to determine the exposure of TV viewing and binge eating on obesity. A total of 75 obese cases were studied, among whom 50 had TV viewing with binge eating habit. Also 50 students from among the controls too had the habit. Draw the 2*2 table and determine the risk associated with the habit.

outcome \ exposure	Obesity +	Obesity -	Total
TV watching with binge eating	50	50	100
No exposure	25	75	100
Total	75	125	200

$$\text{Odds ratio} = ad/bc = (50*75)/(50*25) = 3750/1250 = 3$$

Interpretation: Hence we interpret that exposure to TV watching with binge eating is associated with three times the risk to develop obesity than the unexposed group.

Questions on how to overcome bias

1. Consider the following scenario. A survey was done to probe the pesticide exposure to study the association with cancer. The interviewer excessively probed on the exposure to pesticide history and thereby increased the number of cancer cases with exposure history leading to overestimation of odds ratio.

Determine the type of bias introduced here and mention the methods to overcome it.

outcome \ exposure	Esophageal cancer +	Esophageal cancer -	Total
Smokers	96	104	
Non smokers	102	650	
Total			

$$\text{Odds ratio} = (96*650)/(104*102) =$$

$$62400/10608 = 5.88$$

outcome \ exposure	Esophageal cancer +	Esophageal cancer -	Total
Smokers	126↑	104	
Non smokers	72	650	
Total			

$$\text{OR} = (126 * 650)/(72 * 104) =$$

$$81900/ 7488 = 10.93$$

Excess probing of interviewer has led to overestimation of risk.

Methods to minimize interviewer bias:

- Blinding of interviewer and subject
- Training of interviewers
- Using a validated tool preferably closed ended

2. Mothers of children with congenital defects fail to recollect the dietary or drug history during pregnancy leading to underestimation of OR. What is type of bias that is related to this scenario and provide its solution.

outcome exposure	Congenital defect babies +	Congenital defect babies -	Total
drug history +	60	50	
drug history -	30	65	
Total			

$$OR = (60 \cdot 65) / (50 \cdot 30)$$

$$3900 / 1500 = 2.6$$

outcome exposure	Congenital defect babies +	Congenital defect babies -	Total
drug history +	40	50	
drug history -	50	65	
Total			

$$OR = (40 \cdot 65) / (50 \cdot 50)$$

$$2600 / 2500 = 1.04$$

Under reporting of recall history has led to underestimation of risk.

Methods to overcome recall bias:

- Reducing the time interval of recall period.
- Cross examination from medical records, employment records.
- Confirmation of information with family members