

Midterm Review Answers

Problem 2

Question:

A researcher is studying the association between a new drug and disease remission across two different hospitals. The data collected is summarized in the following stratified contingency tables:

	Remission (+)	Remission (-)	Total
Drug	40	20	60
Placebo	30	30	60

	Remission (+)	Remission (-)	Total
Drug	50	30	80
Placebo	20	40	60

Solution:

To calculate the **Mantel-Haenszel Common Odds Ratio (MH OR)**, we use the formula:

$$OR_{MH} = \frac{\sum \frac{a_i d_i}{n_i}}{\sum \frac{b_i c_i}{n_i}}$$

where for each stratum i :

- a_i = number of exposed cases (Drug & Remission +)
- b_i = number of exposed non-cases (Drug & Remission -)
- c_i = number of unexposed cases (Placebo & Remission +)
- d_i = number of unexposed non-cases (Placebo & Remission -)
- n_i = total number of observations in the stratum

Step 1: Extract Data from Each Hospital

For **Hospital 1**:

$$a_1 = 40, \quad b_1 = 20, \quad c_1 = 30, \quad d_1 = 30, \quad n_1 = 120$$

For **Hospital 2**:

$$a_2 = 50, \quad b_2 = 30, \quad c_2 = 20, \quad d_2 = 40, \quad n_2 = 140$$

Step 2: Compute the Mantel-Haenszel Components

$$\begin{aligned} \sum \frac{a_i d_i}{n_i} &= \frac{(40 \times 30)}{120} + \frac{(50 \times 40)}{140} \\ &= \frac{1200}{120} + \frac{2000}{140} \\ &= 10 + 14.29 = 24.29 \end{aligned}$$

$$\begin{aligned} \sum \frac{b_i c_i}{n_i} &= \frac{(20 \times 30)}{120} + \frac{(30 \times 20)}{140} \\ &= \frac{600}{120} + \frac{600}{140} \\ &= 5 + 4.29 = 9.29 \end{aligned}$$

Step 3: Compute the Mantel-Haenszel Common Odds Ratio

$$OR_{MH} = \frac{24.29}{9.29} = 2.61$$

Step 4: Interpretation

Since the **Mantel-Haenszel common odds ratio** is **2.61**, this suggests that across both hospitals, patients receiving the drug have **2.61 times higher odds** of experiencing remission compared to those receiving the placebo. This indicates a **strong positive association** between the drug and disease remission.