

Problem 3.16

July 19, 2021

A randomized clinical trial compares aspirin to placebo for the prevention of heart attacks and strokes. Out of 1000 subjects on aspirin, there were 80 heart attacks and 65 strokes. Out of 2000 subjects on placebo, there were 240 heart attacks and 165 strokes.

- Are taking aspirin and heart attacks independent?
- Are taking aspirin and strokes independent?
- Write the DATA and PROC statements to get the relative risk for heart attacks.
- Compute the relative risk for heart attacks and strokes as a result of taking aspirin.

a. Are taking aspirin and heart attacks independent?

Table 1: Two by two table: Group vs Outcome

	HA	No HA	
Aspirin	80 (106.7)	920 (893.3)	1000
Placebo	240 (213.3)	1760 (1786.7)	2000
	320	2680	3000

$$\chi^2 = 11.194, p\text{-value} = P(\chi^2_{(1)} > 11.194) = 0.00082.$$

Reject independence! Aspirin and HA dependent!

b. Are taking aspirin and strokes independent?

Table 2: Two by two table: Group vs Outcome

	Stroke	No Stroke	
Aspirin	65 (76.7)	935 (923.3)	1000
Placebo	165 (153.3)	1835 (1846.7)	2000
	230	2770	3000

$$\chi^2 = 2.884, p\text{-value} = P(\chi^2_{(1)} > 2.884) = 0.08945.$$

Yes! Aspirin and strokes independent (borderline)!

c. Write the DATA and PROC statements to get the relative risk for heart attacks.

```
DATA HA;
INPUT GROUP $ OUTCOME $ COUNT_HA;
DATALINES;
ASPIRIN YES 80
ASPIRIN NO 920
PLACEBO YES 240
PLACEBO NO 1760
;

PROC FREQ DATA=HA;
TABLES GROUP*OUTCOME/CMH CHISQ;
WEIGHT COUNT_HA;
RUN;
```

SAS reverses the HA Table alphabetically: NO before YES

Table 3: Two by two table: Group vs Outcome

	No HA	Yes HA	
Aspirin	920 (893.3)	80 (106.7)	1000
Placebo	1760 (1786.7)	240 (213.3)	2000
	2680	320	3000

Statistics for Table of GROUP by OUTCOME

```
Statistic DF Value Prob
Chi-Square 1 11.1940 0.0008 <----- Reject independence!!!
Likelihood Ratio Chi-Square 1 11.6949 0.0006
Continuity Adj. Chi-Square 1 10.7782 0.0010
Mantel-Haenszel Chi-Square 1 11.1903 0.0008
Phi Coefficient 0.0611
Contingency Coefficient 0.0610
Cramer's V 0.0611

Fisher's Exact Test (Is it an asymptotic test???)
Cell (1,1) Frequency (F) 920
Left-sided Pr <= F 0.9997
Right-sided Pr >= F 0.0004 <----- 920 > 893.3 !!! Reject independence!!!

Table Probability (P) 0.0002
Two-sided Pr <= P 0.0007
Sample Size = 3000
```

Summary Statistics for GROUP by OUTCOME

```
Cochran-Mantel-Haenszel Statistics (Based on Table Scores)
Statistic Alternative Hypothesis DF Value Prob
1 Nonzero Correlation 1 11.1903 0.0008
2 Row Mean Scores Differ 1 11.1903 0.0008
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3 General Association 1 11.1903 0.0008
Common Odds Ratio and Relative Risks
Statistic Method Value 95% Confidence Limits
Odds Ratio Mantel-Haenszel 1.5682 1.2028 2.0446 <----- (920*240)/(1760*80)
  Logit 1.5682 1.2028 2.0446
Relative Risk (Column 1) Mantel-Haenszel 1.0455 1.0202 1.0713
  Logit 1.0455 1.0202 1.0713
Relative Risk (Column 2) Mantel-Haenszel 0.6667 0.5237 0.8487
  Logit 0.6667 0.5237 0.8487 <---- RR(HA)!!!
Total Sample Size = 3000

```

d. Compute the relative risk for heart attacks and strokes as a result of taking aspirin.

$$RR(HA) = (80/1000)/(240/2000) = 0.667, \quad RI = (0.5237, 0.8487)$$

$$RR(STK) = (65/1000)/(165/2000) = 0.7879, \quad RI = (0.5974, 1.0391)$$