

Homework Set #4 Solutions

(1.) retrospective study		<u>cancer</u>	<u>no cancer</u>
alcohol	high	71	82
consumption	low	60	441
		<u>131</u>	<u>523</u>

$$(a) \hat{\Theta} = \frac{71(441)}{60(82)} = 6.364$$

(b) Since $\hat{\Theta} > 1$, we estimate that high alcohol consumers have a greater probability of esophagus cancer.

(c) When the probability of disease in the study population is small for both input groups, the odds ratio approximates the relative risk.

		Wife's Rating			
		1	2	3	4
Husband's Rating	1	7	7	2	3
	2	2	8	3	7
	3	1	5	4	9
	4	2	8	9	14

(a) Cross-sectional sampling was used to collect the data.

The input variable and response variable are both ordinal, and the suspected relationship is monotonic.

In general, $(J-1)(J-1) = 9$ parameters would be needed to describe the relationship.

② continued

$C = 1508$ is the number of concordant pairs

$D = 709$ is the number of discordant pairs

$n = 91$ is the sample size.

$$\hat{\pi}_c = \frac{C}{\binom{n}{2}} = .368, \quad \hat{\pi}_d = \frac{D}{\binom{n}{2}} = .173$$

$$\hat{\gamma} = \frac{C - D}{C + D} = .36$$

We estimate that there is a medium size, positive association between Husband's Rating and Wife's Rating.

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counts = matrix(c(7,7,2,3,2,8,3,7,1,5,4,9,2,8,9,14),nrow = 4,byrow = TRUE)
> dimnames(counts) = list(husband=c("never","fair","very","always"),
+                           wife=c("never","fair","very","always"))
> counts
      wife
husband never fair very always
  never      7    7    2      3
  fair      2    8    3      7
  very      1    5    4      9
  always     2    8    9     14
> a=4
> b=4
> con = 0
> i=1
> j=1
> for (i in 1:(a-1)) {
+   for (j in 1:(b-1)) {
+     sub = 0
+     h=i+1
+     while (h <= a) {
+       k=j+1
+       while (k <= b) {
+         sub = sub + counts[h,k]
+         k=k+1
+       }
+       h=h+1
+     }
+     con = con + counts[i,j]*sub
+     j=j+1
+   }
+   i=i+1
+ }
> a=4
> b=4
> dis = 0
> i=1
> j=1
> for (i in 1:(a-1)) {
+   for (j in 2:b) {
+     sub = 0
+     h=i+1
+     while (h <= a) {
+       k=j-1
+       while (k >= 1) {
+         sub = sub + counts[h,k]
+         k=k-1
+       }
+       h=h+1
+     }
+     dis = dis + counts[i,j]*sub
+     j=j+1
+   }
+   i=i+1
+ }
> print(c(con,dis))
[1] 1508  709
> n=sum(counts)
> pi.hat.C = 2*con /n/(n-1)
> pi.hat.D = 2*dis /n/(n-1)
> print(c(pi.hat.C,pi.hat.D))
[1] 0.368254 0.173138
> gamma.hat = (con-dis)/(con+dis)
> print(gamma.hat,digits = 3)
[1] 0.36

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