

Lab 3: 2x2 Contingency table

For the third lab the class filled in a 2x2 contingency table according to their morning habits: coffee drinker (Y/N) and breakfast eater (Y/N). The table and class data are given below:

		Coffee		Total
		Y	N	
Breakfast	Y	36	25	61
	N	3	7	10
	Total	39	32	71

This is a Chisq test of independence.

H_0 : Eating breakfast is independent of drinking coffee

H_a : There is an association between eating breakfast and drinking coffee

$H_0: p_{ij} = p_i \cdot p_j$

$H_a: p_{ij} \neq p_i \cdot p_j$

With $\alpha = 0.05$, 1 df, $\text{Chisq}_{0.05,1} = 3.841$; Reject H_0 if $\text{Chisq}_{\text{obs}} > 3.841$

		Coffee		Total
		Y	N	
Breakfast	Y	$39 \cdot 61 / 71$	$32 \cdot 61 / 71$	61
	N	$39 \cdot 10 / 71$	$32 \cdot 10 / 71$	10
	Total	39	32	71

		Coffee		Total
		Y	N	
Breakfast	Y	33.51	27.49	61
	N	5.49	4.51	10
	Total	39	32	71

$$\chi^2_{\text{obs}} = \frac{(36 - 33.51)^2}{33.51} + \frac{(25 - 27.49)^2}{27.49} + \frac{(3 - 5.49)^2}{5.49} + \frac{(7 - 4.51)^2}{4.51} = 2.91 < 3.841$$

Fail to reject H_0 : Conclude that there is no evidence for an association between coffee drinking and eating breakfast.

Yate's Correction:

$$|36 \cdot 7 - 25 \cdot 3| = 177 > 71/2$$

$$\chi^2_Y = \frac{71(177 - 33.5)^2}{39 \cdot 32 \cdot 61 \cdot 10} = 1.867$$

Cochran's Correction:

$$\hat{f}_{\min} = 4.51; |f - \hat{f}_{\min}| = |7 - 4.51| = 2.49 < 2 \cdot 4.51; D = 2.0$$

$$\chi^2_C = \frac{71^3 \cdot 2^2}{39 \cdot 32 \cdot 61 \cdot 10} = 1.880$$

$$1.867 < 1.880 < 2.91$$

Fail to reject in all cases.