

①

	gum	patch	total
Smoking	191 (199.1)	263 (254.9)	454
not	59 (50.9)	57 (65.1)	116
total	250		570

$H_0$ : there is no association between success & method.

$H_a$ : there is an association

$$\chi^2 = \sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}} = 2.88$$

$$df = (2-1)(2-1) = 1$$

Critical number corresponding to  $df=1$ ,  $\alpha=0.05$ : 3.84

Since  $\chi^2 = 2.88 < 3.84$ , we do not reject  $H_0$ .

②

	left	right	total
male	83 (89)	17 (11)	100
female	184 (178)	16 (22)	200
total	267	33	300

$H_0$ : there is no association between gender & left handedness.

$H_a$ : there is an association.

$$\chi^2 = \sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}} = 5.52$$

$$df = 1$$

critical number for  $df=1$ ,  $\alpha=0.05$ : 3.84

critical number for  $df=1$ ,  $\alpha=0.01$ : 6.63

$\therefore$  data shows a significant relationship at the  $\alpha=0.05$  level, but not at the  $\alpha=0.01$  level.

3

	police	cashier	taxi driver	guard	total
homicide	82 (112.9)	107 (75.3)	70 (64.2)	59 (65.5)	318
other	92 (61.1)	9 (40.7)	29 (34.8)	42 (35.5)	172
total	174	116	99	101	490

2

$H_0$ : there is no association between occupation & whether death on the job was due to homicide.

$H_a$ : there is an association.

$$\chi^2 = \sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}} = 65.4$$

$$df = (2-1)(4-1) = 3$$

critical number for  $df=3$ ,  $\alpha = 0.001$  is 16.27, and  $\chi^2$  is well above this value.

$\therefore$  evidence is highly significant that there is an association between occupation & whether death on the job was due to homicide. Thus we reject  $H_0$ .

4

	heads	tails	total
flip	14,709 (14,031)	14,306 (14,984)	29,015
spin	9197 (9875)	11,225 (10,547)	20,422
total	23,906	25,531	49,437

$H_0$ : there is no association between outcome and method

$H_a$ : there is an association.

$$\chi^2 = \sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}} = 154$$

$$df = 1$$

critical number of  $df=1$ ,  $\alpha = 0.001$  is 10.83, and

Since  $\chi^2 > 10.83$  we reject  $H_0$ : there is strong evidence that there is an association between outcome & method.