H_0: There is no relationship b/w smoking status and disease

H_1: There is relationship b/w smoking and disease

	Disease	No disease	Row total
Smoker	60	90	150
Non-Smoker	30	120	150
Column total	90	210	300

$$X^2 = \frac{\Sigma (O_i - E_i)^2}{E_i}$$

Smoker disease:

$$E_i = \frac{\text{Row total} \times \text{column total}}{\text{Grand total}}$$

$$= \frac{90 \times 150}{300} \Rightarrow \frac{13,500}{300}$$

$$= 45$$

Smoker No disease:

$$E_i = \frac{150 \times 210}{300} = \frac{18,900}{300} \Rightarrow \frac{31500}{300} = 105$$

Non Smoker · Disease

$$E_i = \frac{150 \times 90}{300} = 45$$

Non-Smoker - No Disease:

$$E_i = \frac{150 \times 210}{300} = 105$$

O	E	$O_i - E_i$	$(O-E)^2$
60	45	15	225
90	105	-15	225
30	45	-15	225
120	105	15	225

$$X^2 = \frac{225}{45} + \frac{225}{105} + \frac{225}{45} + \frac{225}{105}$$

$$= 5 + 2.14 + 5 + 2.14$$

$$= 10 + 4.28$$

$$= 14.28$$

degree of freedom:

$$(R-1) \cdot (C-1) = (2-1) \cdot (2-1)$$

$$= 1 \cdot 1 = 1$$

$$\chi^2_{\text{critical}} = 3.841$$

$$\chi^2_{\text{actual}} = 14.28$$

Here, reject null hypothesis (H_0)