



Chi - Square Test for Independence of Attributes .

Attribute means quality or character^{istic}
eg: drinking, blindness, honesty, softness etc
Attribute can be marked into presence or absence in a number of given population. The frequency is given by 2×2 contingency table .

a	b		a+b	dof : = (r-1)(s-1)
c	d		c+d	
a+c	b+d		N	



Expected frequency .

$$E(a) = \frac{(a+c)(a+b)}{N} \quad E(b) = \frac{(b+d)(a+b)}{N}$$
$$E(c) = \frac{(a+c)(c+d)}{N} \quad E(d) = \frac{(b+d)(c+d)}{N}$$

1) On the basis of information given below about the treatment of 200 patients suffering from a disease, state whether the new treatment is comparatively superior to the conventional treatment.

	Favourable	Not favorable	Total
New	60	30	90
Conventional	40	70	110
	100	100	

H_0 : No difference between new and conventional treatment. (Attributes are independent.)

$$Dof : (r-1)(s-1) = (2-1)(2-1) = 1$$



Expected frequency -

$$E(60) = \frac{90 \times 100}{200} = 45$$

$$E(40) = \frac{100 \times 110}{200} = 55$$

$$E(30) = \frac{90 \times 100}{200} = 45$$

$$E(70) = \frac{110 \times 100}{200} = 55$$

O	E	$(O-E)^2$	$\frac{(O-E)^2}{E}$
60	45	225	5
30	45	225	5
40	55	225	4.09
70	55	225	4.09
			<hr/> 18.18

Test Statistic: $\chi^2 = \frac{(O-E)^2}{E} = 18.18$

Critical value: $\alpha = 5\%$ dof: 1.

$$\chi^2_{\alpha} = 3.841$$

Conclusion: $18.18 > 3.841$.

H_0 rejected.



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