

# Sociology 357: How to calculate $t$ and $\chi^2$

(K)

Here are a set of data (fake, of course) and instructions on how to analyze it by t-test and, when it is collapsed, by chi-square. First, the data:

Group 1		Group 2	
X	X <sup>2</sup>	X	X <sup>2</sup>
2	4	5	25
3	9	5	25
5	25	4	16
1	1	4	16
1	1	4	16
3	9	3	9
2	4	2	4
1	1	3	9
1	1	1	1
1	1	5	25

Sums: X: 20 X<sup>2</sup>:65      X: 36 X<sup>2</sup>:146

$$s^2 = \frac{65 + 146 - \frac{(20)^2}{10} - \frac{(36)^2}{10}}{10 + 10 - 2} = 2.3$$

$$t = \frac{2 - 3.6}{\sqrt{\frac{20}{100} \times 2.3}} = 2.36$$

p < .05

This is the formula for t:

and for s<sup>2</sup>:

$$t = \frac{M_1 - M_2}{\sqrt{\frac{N_1 + N_2}{N_1 * N_2} * s^2}}$$

$$s^2 = \frac{\sum X_1^2 + \sum X_2^2 - \frac{(\sum X_1)^2}{N_1} - \frac{(\sum X_2)^2}{N_2}}{N_1 + N_2 - 2}$$

Chi-square: Collapse the distribution for each group into 1's and 2's in one group and 3-5 in the other group. You get a table like this:

	Group 1		Group 2		
High	A	3	B	8	(A+B) 11
Low	C	7	D	2	(C+D) 9
	(A+C)	10	(B+D)	10	N 20

$$\chi^2 = \frac{20(16 - 561)}{10 \times 10 \times 11 \times 9} = \frac{50000}{9900} = 5.05$$

p < .05

The formula for Chi-square is:

$$\frac{N(|AD - BC|)^2}{(A+B)(C+D)(A+C)(B+D)}$$