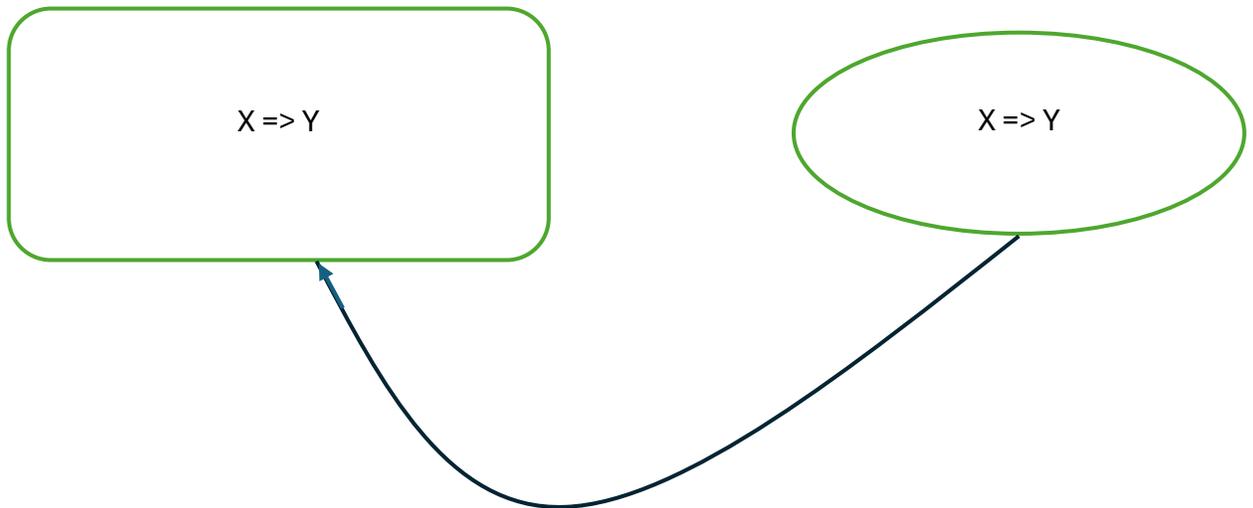


Chapter 10 chi square (χ^2)

1) Basics to Inferential Statistics



P: probability that the null hypothesis is true

$$0 < P < 1 \text{ or } 100\%$$

	True null hypothesis	False null hypothesis
When $P < .05$ or 5% Reject	Type I error	OK
When $P \geq .05$ or 5% Not to reject	OK	Type II error

2) Crosstab example

	white	Black	RM
Kamela Harris	257 $(\frac{316 \times 628}{713} = 278.3)$	59 $(\frac{316 \times 85}{713} = 37.7)$	316
Donald Trump	371 $(\frac{397 \times 628}{713} = 349.7)$	26 $(\frac{397 \times 85}{713} = 47.3)$	397
CM	628	85	N = 713

- 1) Null hypothesis: race has nothing to do with the presidential votes
- 2) Computing the expected frequencies (F_e)

$$F_e = \frac{RM \times CM}{N}$$

3) Computing chi square

$$\chi^2 = \sum \frac{(F_o - F_e)^2}{F_e}$$

$$\chi^2 = \frac{(257 - 278.3)^2}{278.3} + \frac{(59 - 37.7)^2}{37.7} + \frac{(371 - 349.7)^2}{349.7} + \frac{(26 - 47.3)^2}{47.3}$$

$$\chi^2 = 24.6$$

4) Compute degree of freedom (df)

$$df = (r - 1)(c - 1) \quad r: \text{the number of rows}; c: \text{the number of columns}$$

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

5) Determine the p value based on the chi-square and df

$$P < .001$$

6) Decision regarding the null hypothesis, type of error committed

Reject the null hypothesis, committing type I error

Exercise: conduct the chi-square analysis for the following crosstab between education (independent variable) and recycle (dependent variable)

	< HS	HS	College	RM
Recycle	25	36	47	108
Not recycle	63	39	12	114
CM	88	75	59	N = 222

1) Null hypothesis: education has nothing to do with the recycle

2) Computing the expected frequencies

$$F_E = \frac{RM \times CM}{N}$$

3) Compute chi-square

$$\chi^2 = \sum \frac{(F_o - F_e)^2}{F_e} = 37.2$$

4) Compute df (degree of freedom)

$$df = (r - 1)(c - 1) \quad r: \text{the number of rows}; c: \text{the number of columns}$$

$$df = (r - 1)(c - 1) = (3 - 1)(2 - 1) = 2$$

5) Determine the p value by looking at the chi-square distribution table

$$P < .001$$

6) Decision regarding the null hypothesis, type of error committed

Reject the null hypothesis, committing type I error