

Question 3 in the ANOVA exercise

- 1) Null hypothesis: place of residence has nothing to do with the hours studying

$$2) \bar{X}_T = \frac{1+3+0+1+0+3+1+3+3+5+2+1+0+4+3}{15} = 2$$

$$\bar{X}_{Rural} = \frac{1 + 3 + 0 + 1 + 0}{5} = 1$$

$$\bar{X}_{Suburban} = \frac{3 + 1 + 3 + 3 + 5}{5} = 3$$

$$\bar{X}_{Urban} = \frac{2 + 1 + 0 + 4 + 3}{5} = 2$$

$$3) SS_{Total} = \sum (X_i - \bar{X}_T)^2$$
$$SS_{Total} = (1 - 2)^2 + (3 - 2)^2 + (0 - 2)^2 + (1 - 2)^2 + (0 - 2)^2 + (3 - 2)^2$$
$$+ (1 - 2)^2 + (3 - 2)^2 + (3 - 2)^2 + (5 - 2)^2 + (2 - 2)^2 + (1 - 2)^2$$
$$+ (0 - 2)^2 + (4 - 2)^2 + (3 - 2)^2$$

$$SS_{Total} = \sum (X_i - \bar{X}_T)^2 = 34$$

$$4) SS_{Between} = \sum (\bar{X}_G - \bar{X}_T)^2 \times N_G$$
$$SS_{Between} = (1 - 2)^2 \times 5 + (3 - 2)^2 \times 5 + (2 - 2)^2 \times 5 = 10$$

5) Because $SS_{Total} = SS_{Between} + SS_{Within} \Rightarrow SS_{Within} = SS_{Total} - SS_{Between}$

$$SS_{Within} = 34 - 10 = 24$$

- 6) Computing df for between and df for within

$df_{between} = K - 1$ whereas K is the total number of groups in the independent variable

$$df_{between} = 3 - 1 = 2$$

$df_{within} = N - K$ whereas N is the total number of cases

$$df_{within} = N - K = 15 - 3 = 12$$

7) Computing MSS for between and MSS for within

$$MSS_{Between} = \frac{SS_{Between}}{df_{Between}} = \frac{10}{2} = 5$$

$$MSS_{Within} = \frac{SS_{within}}{df_{within}} = \frac{24}{12} = 2$$

8) Computing the f ratio

$$F = \frac{MSS_{Between}}{MSS_{Within}} = \frac{5}{2} = 2.5$$

9) Determining the p value

$$P > .05$$

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

Do not reject the null hypothesis, committing type II error

11) Computing the eta square

$$E^2 = \frac{SS_{Between}}{SS_{Total}} = \frac{10}{34} = 29.4\%$$

12) Interpreting eta-square

PRE: knowing the independent variable reduces errors in estimating the value of dependent variable by X%.

Knowing the please of residence reduces errors in estimating the study hours by 29.4%.

ANOVA Table

	Sum of Squares	df	MSS	F ratio	P level	Eta-square
Between	10	2	5	2.5	P > .05	29.4%
Within	24	12	2			
Total	34	14				