

### Hand Computation Example of Data from Cohen Table 2.2.2

| Years Since PhD  |               |                                | Number of Publications |               |   |
|------------------|---------------|--------------------------------|------------------------|---------------|---|
| $X$              | $X - \bar{X}$ | $(X - \bar{X})^2$              | $Y$                    | $Y - \bar{Y}$ | $(X - \bar{X})(Y - \bar{Y})$              |
| 3                | -4.67         | 21.81                          | 18                     | -1.93         | 9.01                                      |
| 6                | -1.67         | 2.79                           | 3                      | -16.93        | 28.27                                     |
| 3                | -4.67         | 21.81                          | 2                      | -17.93        | 83.73                                     |
| 8                | 0.33          | 0.11                           | 17                     | -2.93         | -0.97                                     |
| 9                | 1.33          | 1.77                           | 11                     | -8.93         | -11.88                                    |
| 6                | -1.67         | 2.79                           | 6                      | -13.93        | 23.26                                     |
| 16               | 8.33          | 69.39                          | 38                     | 18.07         | 150.52                                    |
| 10               | 2.33          | 5.43                           | 48                     | 28.07         | 65.40                                     |
| 2                | -5.67         | 32.15                          | 9                      | -10.93        | 61.97                                     |
| 5                | -2.67         | 7.13                           | 22                     | 2.07          | -5.53                                     |
| 5                | -2.67         | 7.13                           | 30                     | 10.07         | -26.89                                    |
| 6                | -1.67         | 2.79                           | 21                     | 1.07          | -1.79                                     |
| 7                | -0.67         | 0.45                           | 10                     | -9.93         | 6.65                                      |
| 11               | 3.33          | 11.09                          | 27                     | 7.07          | 23.54                                     |
| 18               | 10.33         | 106.71                         | 37                     | 17.07         | 176.33                                    |
| $\bar{X} = 7.67$ |               | $\sum(X - \bar{X})^2 = 293.33$ | $\bar{Y} = 19.93$      |               | $\sum(X - \bar{X})(Y - \bar{Y}) = 581.67$ |

#### Unstandardized regression coefficient:

$$B_1 = \frac{\sum(X - \bar{X})(Y - \bar{Y})}{\sum(X - \bar{X})^2}$$

$$= \frac{581.67}{293.33}$$

$$= 1.98$$

#### Intercept:

$$B_0 = \bar{Y} - B_1\bar{X}$$

$$= 19.93 - 1.98(7.67)$$

$$= 4.74$$

#### Regression line:

$$\hat{Y} = 4.74 + 1.98X$$

#### Standardized regression coefficient:

$$sd_x = \sqrt{\frac{\sum(X - \bar{X})^2}{n-1}} = \sqrt{\frac{293.33}{15-1}} = 4.58$$

$$sd_y = 13.82$$

$$\beta_1 = B_1 \left( \frac{sd_x}{sd_y} \right) = 1.98 \left( \frac{4.58}{13.82} \right) = .66$$

A simple regression analysis was conducted to examine the relationship between the years of experience of a faculty member and his or her number of peer-reviewed publications. Results indicated that the years of experience significantly predicted the number of publications,  $b = 1.98$ ,  $SE = .632$ ,  $\beta = .66$ . For each additional year of experience, the faculty member published approximately 2 (1.98) additional publications. Years of experience accounted for a large percentage of variance in the number of publications,  $R^2 = .44$ .

### SPSS Example of Simple Regression

| Descriptive Statistics |         |                |    | Correlations        |         |       |       |
|------------------------|---------|----------------|----|---------------------|---------|-------|-------|
|                        | Mean    | Std. Deviation | N  |                     |         |       |       |
| numpubs                | 19.9333 | 13.82269       | 15 | Pearson Correlation | numpubs | 1.000 | .657  |
| yrspdh                 | 7.6667  | 4.57738        | 15 |                     | yrspdh  | .657  | 1.000 |
|                        |         |                |    | Sig. (1-tailed)     | numpubs | .     | .004  |
|                        |         |                |    |                     | yrspdh  | .004  | .     |
|                        |         |                |    | N                   | numpubs | 15    | 15    |
|                        |         |                |    |                     | yrspdh  | 15    | 15    |

  

| Variables Entered/Removed <sup>b</sup> |                     |                   |        | Model Summary |                   |          |                   |                            |
|--|---------------------|-------------------|--------|---------------|-------------------|----------|-------------------|----------------------------|
| Model                                  | Variables Entered   | Variables Removed | Method | Model         | R                 | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1                                      | yrspdh <sup>a</sup> | .                 | Enter  | 1             | .657 <sup>a</sup> | .431     | .387              | 10.81848                   |

a. All requested variables entered.  
b. Dependent Variable: numpubs

a. Predictors: (Constant), yrsphd

### ANOVA<sup>b</sup>

| Model |            | Sum of Squares | df | Mean Square | F     | Sig.              |
|-------|------------|----------------|----|-------------|-------|-------------------|
| 1     | Regression | 1153.419       | 1  | 1153.419    | 9.855 | .008 <sup>a</sup> |
|       | Residual   | 1521.515       | 13 | 117.040     |       |                   |
|       | Total      | 2674.933       | 14 |             |       |                   |

- a. Predictors: (Constant), yrsphd  
b. Dependent Variable: numpubs

### Coefficients<sup>a</sup>

| Model |            | Unstandardized Coefficients |            | Standardized Coefficients | t     | Sig. | 95% Confidence Interval for B |             |
|-------|------------|-----------------------------|------------|---------------------------|-------|------|-------------------------------|-------------|
|       |            | B                           | Std. Error | Beta                      |       |      | Lower Bound                   | Upper Bound |
| 1     | (Constant) | 4.731                       | 5.591      |                           | .846  | .413 | -7.347                        | 16.808      |
|       | yrspdh     | 1.983                       | .632       | .657                      | 3.139 | .008 | .618                          | 3.348       |

- a. Dependent Variable: numpubs