Job Satisfaction DATA
Exercises Answers

In the appendix of the textbook, you will find a description of this data as DATA FILE #3.

1. In the PRACTICAL EXERCISES section of Chapter 1, which begins at the bottom of page 18, read the first two paragraphs of Part 1, and observe that the four statistical analyses listed in parts (a), (b), (c), and (d) are mentioned. Note that there are seven questions to be answered for each analysis. Do the following for each of parts (a), (b), (c), and (d), and use $\alpha = 0.05$ for all inferential statistical analyses:

(i) Answer questions 3 and 4 by choosing all of the following that apply:

- Pearson correlation
- Spearman rank correlation
- (two) independent samples $t$ test
- Mann-Whitney rank sum test
- dependent (paired samples) $t$ test
- Wilcoxon signed rank test
- one-way ANOVA $F$ test
- Kruskal-Wallis rank sum test
- chi-square test for association

(ii) Answer question 2 by first identifying which variable is most likely to be considered a dependent variable, and which variable is most likely to be considered an independent variable; then for each variable, indicate whether it is most likely to be treated as qualitative-dichotomous, qualitative-nominal, qualitative-ordinal, or continuous.

(iii) Answer question 1 by stating $H_0$ and $H_1$.

(iv) Answer question 5 by using SPSS to obtain the output corresponding to all of the tests selected in (i), and be sure to include an appropriate graphical display; insert the SPSS output with the pages for this exercise.

(v) Answer questions 6 and 7 by writing an appropriate summary of the results in a Word document named Well_Being_Result_Summaries in a section titled Chapter 1 Practical Exercises – Part 1(insert a, b, c, or d).
1.-continued
(a) Association between Ethnicity and Marital Status

(i) Since the association between two qualitative variables is being studied, a chi-square test for association (considered nonparametric) is appropriate. The primary assumption required to be satisfied is that each expected frequency be at least 5.

(ii) The variables of interest are ethnicity and marital status, each of which is qualitative. An independent variable and a dependent variable are not clearly identified; however, it would seem more natural to study the influence of ethnicity on marital status, thereby making ethnicity the independent variable and marital status the dependent variable.

(iii) **Null Hypothesis:** There is no association between ethnicity and marital status. OR The distribution of marital status categories is the same for Jews and Arab.

**Alternative Hypothesis:** There is an association between ethnicity and marital status. OR The distribution of marital status categories is not the same for Jews and Arab. (one-sided, since the chi-square test for association is generally one-sided)

(v) The results of the chi-square test show no significant association between ethnicity and marital status ($\chi^2 = 5.222, \chi^2; 0.05 = 5.991, p = 0.073$) at the 0.05 significance level but do show a significant association at the 0.10 level. Cramer’s V (0.155) suggests that only 2.4% of the variation in marital status is accounted for by ethnicity.
1.-continued
   (b) Relationship between Burnout and Ethnicity

   (i) Since the association between one qualitative-dichotomous variable and one quantitative variable is being studied, an independent samples $t$ test (parametric) is appropriate. If any of the required assumptions are not satisfied, an alternative test is the Mann-Whitney rank sum test (nonparametric).

   (ii) The variables of interest are levels of burnout, which can be treated as quantitative, and ethnicity, which is qualitative-dichotomous. The independent variable is ethnicity, and the dependent variable is levels of burnout.

   (iii) **Null Hypothesis:** There is no association between levels of burnout and ethnicity. OR The mean burnout level is not different for Jews and Arabs.

   **Alternative Hypothesis:** There is an association between levels of burnout and ethnicity. OR The mean burnout level is different for Jews and Arabs. (two-sided)

   (v) The results of Levene’s test show no statistically significant difference in standard deviation of burnout level at the 0.05 level between Jewish and Arab social service employees in Israel ($f_{1, 215} = 1.124, f_{1, 215; 0.05} = 3.895$ OR $3.94, p = 0.290$). This suggests that the pooled $t$ test can be used to test for a difference in mean burnout.

   The mean burnout level for Arabs ($24.21, n = 72$) and for Jews ($20.27, n = 145$) are statistically significantly different at the 0.05 level ($t_{215} = -4.514, t_{215; 0.025} = 1.960, p < 0.001$). The data suggest a higher mean for Arabs, and we can be 95% confident that the difference is between 2.219 and 5.659.

   The Mann-Whitney rank sum test is statistically significant at the 0.05 level ($z = -4.992, z_{0.025} = 1.960, p < 0.001$) which confirms the results of the independent samples $t$ test.
(c) Relationship between Burnout and Marital Status

(i)
Since the association between one qualitative variable and one quantitative variable is being studied, a one-way ANOVA $f$ test (parametric) is appropriate. If any of the required assumptions are not satisfied, an alternative test is the Kruskal-Wallis rank sum test (nonparametric).

(ii)
The variables of interest are levels of burnout, which can be treated as quantitative, and marital status, which is qualitative. The independent variable is marital status, and the dependent variable is levels of burnout.

(iii)
**Null Hypothesis:** There is no association between levels of burnout and marital status. OR The mean burnout level is not different for married, single, and divorced.

**Alternative Hypothesis:** There is an association between levels of burnout and marital status. OR The mean burnout level is different for at least one of married, single, and divorced. (one-sided, since the one-way ANOVA $f$ test is generally one-sided).

(v)
The results of Levene’s test show no statistically significant difference in standard deviation of burnout level at the 0.05 level among the three marital status categories ($f_{2, 215} = 1.085, f_{2, 215; 0.05} = 3.045$ OR $3.09, p = 0.340$). This suggests that the one-way ANOVA $f$ test can be used to test for at least one difference in mean burnout.

The results of the one-way ANOVA $f$ test show a significant difference at the 0.05 level among the married, single, and divorced social service employees in Israel ($f_{2, 215} = 3.883, f_{2, 215; 0.05} = 3.045$ OR $3.09, p = 0.022$) with regard to mean burnout level. Bonferroni’s multiple comparison was used to identify significant differences between means.

With Bonferroni’s multiple comparison at the 0.05 level, the mean burnout level reported was significantly higher for married employees (22.15, $n = 141$) than for divorced employees (18.67, $n = 30$). The mean burnout level reported was not statistically significantly different
between married employees and single employees (21.68, \( n = 47 \)) and not statistically significantly different between single employees and divorced employees.

The Kruskal-Wallis rank sum test is statistically significant at the 0.05 level (\( \chi^2 = 11.721, \chi^2_{0.05} = 5.991, p = 0.003 \)) which confirms the results of the one-way ANOVA test.
1.-continued
(d) Relationship between Burnout and Promotion Opportunities

(i) Since the association between two quantitative variables is being studied, a Pearson correlation $r$ (parametric) is appropriate. If any of the required assumptions are not satisfied, an alternative test can be based on the Spearman rank correlation rho (nonparametric).

(ii) The variables of interest are levels of burnout, which can be treated as quantitative, and opportunities for promotion, which can be treated as quantitative. An independent variable and a dependent variable are not clearly identified; however, it would seem more natural to study the influence of opportunities for promotion on levels of burnout, thereby making opportunities for promotion the independent variable and levels of burnout the dependent variable.

(iii) **Null Hypothesis:** There is no significant correlation (linear relationship) between levels of burnout and opportunities for promotion. (two-sided)

**Alternative Hypothesis:** There is a significant correlation (linear relationship) between levels of burnout and opportunities for promotion. (two-sided)

(v) The Pearson correlation is statistically significant at the 0.05 level ($r = -0.311, n = 218, p < 0.001$, two-sided). We conclude that there is a significant linear relationship between levels of burnout and opportunities for promotion for social service employees in Israel. The data suggest a negative linear relationship. The Spearman rank correlation is statistically significant at the 0.05 level (rho = $-0.309, n = 218, p < 0.001$, two-sided), which confirms the results from the Pearson correlation.