

Solutions to the Even Numbered Suggested HW Problems : Ch 11 & 15

11.2 a) Dependent.

b) Any population for which the possible responses have the same percentages for men and women.

11.8 a) 3.84 b) 5.99 c) 9.49 d) 26.30 e) 26.30.

11.10 a) H_0 : Marital happiness and family income are independent.

H_a : Marital happiness and family income are dependent.

b) 9.49.

c) p-value is 0 i.e if H_0 is true, the probability of obtaining a χ^2 statistic value of 22.2 or larger is approximately 0.

11.14 a) False b) $z = \sqrt{\chi^2} = 21.25$; p-value = 0.

11.24 Race. The difference between males and females in the proportion who are Democrat is 0.08. The difference between blacks and whites is 0.36.

10.30 a) Difference = 0.00149 \approx 0.0015 i.e the proportion of black males who are victims of a homicide is 0.0015 higher than the proportion of white males who are victims of a homicide.

b) Relative risk = 10.9 i.e black males are 10.9 times more likely than are white males to be the victim of a homicide.

c) Relative risk because it shows that there is a substantial race effect when both proportions are close to 0.

10.32 The analysis in Example 8 is merely descriptive of the sample data, whereas chi squared is an inferential analysis, allowing us to draw conclusions about the sampled population.

11.34 a) The large chi-squared statistic and the small p-value indicate that there is a significant association between happiness and religious attendance.

b) Attendance at most several times a year and “not too happy”; attendance at most several times a year and “pretty happy”; attendance every week or more and “very happy”.

c) Attendance at most several times a year and “very happy”; attendance at least every week and “not too happy”; attendance at least every week and “pretty happy”.

15.2 a) P-value = 0.17 i.e if the treatments had identical effects, the probability would be 0.17 of getting a sample at least as extreme as that observed. So, it is plausible that the studio does not lead to better results than the lotion.

b) P-value = 0.33 i.e if the treatments had identical effects, the probability would be 0.33 of getting a sample at least as extreme as that observed. So, it is plausible that the treatments do not lead to better results.

c) Because the smallest possible p-value is 0.17.

15.4 a) H_0 : The treatments are identical in their effects on respiratory ventilation; H_a : Respiratory ventilation is higher for subjects in the treatment group than in the control group.

b) Rank of controls : 1, 2, 3, 5, 6, 8, 10, 14; mean rank = 6.1.

Rank for treated subjects : 4, 7, 9, 11, 12, 13, 15, 16; mean rank = 10.9.

c) If the treatment had identical effects, the probability would be 0.025 of getting a sample as extreme as

that observed. Since the p-value is low, we have strong evidence to support that the treatment group has higher ventilation levels than the control group.

15.8 a) H_0 : Identical population distribution for the three groups; H_a : At least one population distribution is different from the rest.

b) $H = 7.38$; its approximate sampling distribution is χ^2 with 2 degrees of freedom.

c) P-value is 0.025 i.e if the null hypotheses were true, the probability would be 0.025 of getting a test statistic value at least as extreme as that observed. Since the p-value is low, we have strong evidence that at least one of the population distribution is different.

d) We could use a Wilcoxon test to compare each pair of groups. We can also find the confidence interval for the difference between the population medians for each pair.

15.10 a) $z = 0.82$.

b) P-value is 0.41 i.e if the null hypotheses were true, the probability would be 0.41 of getting a test statistic value at least as extreme as that observed. Since the p-value is high, we fail to reject the null hypotheses i.e it is plausible that the null hypotheses is correct and that $p = 0.50$.

15.16 a) Median = 0 against Median \neq 0.

b) By calculating the sum of ranks for the positive differences.

c) The two sided p-value is 0 i.e if the null hypotheses were true, the probability would be close to 0 of getting a test statistic value at least as extreme as that observed. Since the p-value is so low, we have very strong evidence that the population median of differences is not 0.

d) The estimated median is 47.25. Thus, the population median difference between the reaction times of those not using cell phones and those using cell phones was 47.25.