Name Jerry

Student Number

5

STA 312f2012 Quiz ~~4~~

1. (2 points) For the null hypothesis of independence in a 2×2 table, show that $\frac{\widehat{\mu}_{11}\widehat{\mu}_{22}}{\widehat{\mu}_{12}\widehat{\mu}_{21}} = 1$, so that the estimated odds ratio is one under the null hypothesis. You may use the formula for $\widehat{\mu}_{ij}$ from the formula sheet.

$$\frac{\hat{\mu}_{11}\hat{\mu}_{22}}{\hat{\mu}_{12}\hat{\mu}_{21}} = \frac{\frac{n_{1+}n_{+1}}{n}\,\frac{n_{2+}n_{+2}}{n}}{\frac{n_{1+}n_{+2}}{n}\,\frac{n_{2+}n_{+1}}{n}} = 1$$

2. (2 points) Answer each question True or False. You must get at least 4 out of 5 right in order to get marks for this question.

T In 2×2 tables, statistical independence is equivalent to a population odds ratio value of $\theta = 1.0$.

T We found that a 95% confidence interval for the odds ratio relating having a heart attack (yes, no) to drug (placebo, aspirin) is (1.44, 2.33). If we had formed the table with aspirin in the first row (instead of placebo), then the 95% confidence interval would have been $(1/2.33, 1/1.44) = (0.43, 0.69)$.

F Using a survey of college students, we study the association between opinion about whether it should be legal to (1) use marijuana, (2) drink alcohol if you are 18 years old. We may get a different value for the odds ratio if we treat opinion about marijuana use as the response variable than if we treat alcohol use as the response variable.

T Interchanging two rows or interchanging two columns in a contingency table has no effect on the value of the X^2 or G^2 chi-squared statistics. Thus, these tests treat both the rows and the columns of the contingency table as nominal scale, and if either or both variables are ordinal, the test ignores that information.

F Suppose that income (high, low) and gender are conditionally independent, given type of job (secretarial, construction, service, professional, etc.). Then, income and gender are also independent in the 2×2 marginal table (i.e., ignoring, rather than controlling, type of job).

3. (6 points) Recall that the Death Penalty Data had race of prisoner, race of victim and whether or not the prisoner got the death penalty. In your answers, be guided by the $\alpha = 0.05$ significance level as usual.

   (a) In the 2×2 marginal table of prisoner's race by death penalty, is there evidence of a race difference in getting the death penalty? Answer Yes or No and give a two-sided p-value from Fisher's exact test to support your answer.

   No, $p = 0.7246$

   (b) In the 2×2 marginal table of victim's race by death penalty, is there evidence of an association of victim's race and whether the prisoner got the death penalty? Answer Yes or No and give a two-sided p-value from Fisher's exact test to support your answer.

   Yes $p = 0.02423$

   (c) Look at the relationship of Victim's race to Death penalty *controlling for Prisoner's race.*

      i. In the sub-table for Black prisoners, what is the two-sided p-value from Fisher's exact test?

      $p = 0.03187$

      ii. In plain language, what do you conclude from the preceding test?

      Black prisoners were more likely to get the death penalty when the victim was White.

      iii. In the sub-table for White prisoners, what is the two-sided p-value from Fisher's exact test?

      $p = 0.6007$

      iv. In plain language, what do you conclude from the preceding test?

      For White prisoners, there is no clear evidence of a connection between victim's race and Death penalty.

Do <u>not</u> attach any computer output.