BIOS 665: Problem Set 3

Assigned: September 28, 2017

Due: October 12, 2017

Reminder: For all hypothesis tests, please state the method, the null hypothesis, the test statistic, the degrees of freedom, the p-value, and the interpretation of the test using a two-sided significance level of 5%, unless otherwise stated.

Helpful hints: For estimates and tests, simply copying and pasting SAS output without any commentary will not earn full credit, especially on exams. Highlighting is not considered commentary. However, commentary can be as simple as: The 95% CI for the odds ratio is (\_, \_).

I have followed the Honor Code. Signed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. (25 points) Consider the following data from a randomized clinical trial to assess whether an experimental treatment has a safety concern. Investigators fear that the experimental treatment might be associated with the adverse event of a severe headache after 24 hours of treatment (compared to Placebo). Participants were randomized to either experimental treatment or placebo. The following table contains data on treatment (Experimental/Placebo), sex (Male/Female), and occurrence of a severe headache 24 hours (Yes/No).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Treatment | Sex | Occurrence of Severe Headache after 24 Hours | | Total |
|  |  | Yes | No |
| Experimental | Male | 22 | 34 | 56 |
| Female | 19 | 37 | 56 |
| Placebo | Male | 37 | 18 | 55 |
| Female | 37 | 20 | 57 |

* 1. Under minimal assumptions, conduct a statistical test to assess the association of experimental treatment vs. placebo with occurrence of severe headache after 24 hours of treatment, controlling for sex. Hint: it may be helpful to write out the 2x2 table for males and the 2x2 table for females.
  2. Considering only females, provide an odds ratio for the effect of experimental treatment vs. placebo on occurrence of severe headache after 24 hours. Under minimal assumptions, conduct a statistical test to assess this association.
  3. Provide a (common) odds ratio and a 95% confidence interval for the effect of experimental treatment vs. placebo on the occurrence of severe headache after 24 hours, controlling for sex. You should assume that the effect of experimental treatment on occurrence of severe headache after 24 hours is the same in both males and females. Compare and contrast your results from parts a) and c).
  4. Provide statistical evidence for (or against) the hypothesis that the effect of experimental treatment on the occurrence of a severe headache after 24 hours is the same for each sex. Provide a sentence explaining your results.

1. A company is conducting market research on a newly formulated sports drink. The table shown below summarizes the findings from a study comparing male and female athletes with respect to the degree of favorable opinion about this new sports drink.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Gender | Response | | | Total |
| Unfavorable opinion about new sports drink | Neutral opinion about new sports drink | Favorable opinion about new sports drink |
| Female | 15 | 25 | 60 | 100 |
| Male | 15 | 30 | 55 | 100 |
| Total | 30 | 55 | 115 | 200 |

* 1. Under minimal assumptions, assess the association between gender and (ordinal) degree of favorable opinion with an appropriate statistical test at the two-sided 0.05 level, assigning integer scores to the response categories. Briefly interpret your results in 1-2 sentences; be sure to address whether it would be reasonable for the company to market preferentially to males or to females.
  2. Repeat (a), but assign rank scores for the response categories.
  3. Repeat (a), but assign modified ridit scores for the response categories.
  4. Briefly compare your results across parts (a), (b), and (c). Comment on any noteworthy differences, as well as any similarities (or equivalencies).

1. Consider the data in table below. These data are from a clinical trial conducted in two centers for the comparison of two treatments for a gastrointestinal disorder with respect to a dichotomous response (Good vs. Poor).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | Response | | Total |
| Good | Poor |
| Center 1 | Test Treatment | 32 | 11 | 43 |
| Placebo | 23 | 20 | 43 |
| Center 2 | Test Treatment | 29 | 5 | 34 |
| Placebo | 15 | 17 | 32 |

* 1. For Center 1, provide an estimate for the odds ratio (and its 95% confidence interval) describing the relationship between test treatment and placebo for good versus poor response. Repeat for Center 2. Briefly justify your methods, and interpret the results.
  2. Provide a (common) odds ratio and a 95% confidence interval describing the relationship between test treatment and placebo for good versus poor response, controlling for center. You may assume that the effect of treatment on response is homogeneous across centers.
  3. For Center 1, provide and interpret the results of a statistical test for the association between treatment and response using the two-sided 0.05 significance level. Repeat for Center 2.
  4. Under minimal assumptions, assess the association between treatment and response, controlling for center, with a statistical test at the two-sided 0.05 level. Briefly justify your methods, and interpret the results.
  5. Briefly compare and contrast your center-specific results to your overall results (controlling for center), i.e., compare/contrast a) with b) & compare/contrast c) with d).