STAT 796: Homework 4

Due Sunday, February 17 at 11:59pm on Canvas.

For this assignment, you are asked to consider models and estimates similar to Homeworks 2 and 3 in order to assess their significance and uncertainty. Please provide your R code in an Appendix at the end of your responses.

Note: It appears that the third edition of the HL textbook reversed the coding for vital status in the ICU dataset code book. This is why some of the relationships in previous homeworks and lecture have indicated that the seemingly healthier people died in the ICU. **For this assignment, please use the dataset `icu2.csv`, which has the corrected coding.**

1. Consider the (possible) relationship between ICU visit type and vital status, adjusting for age and sex.
   a. Fit a logistic regression model using `died` as the outcome and `type` as the predictor of interest, also adjusting for `age` and `female`.
   b. What is the adjusted odds ratio corresponding to `type`?
   c. Provide a 95% confidence interval for the odds ratio in (b).
   d. Provide a 90% confidence interval for the odds ratio in (b).
   e. What is the log-likelihood for the model in (a)? In one sentence, explain what this value means.
   f. Perform (i) a likelihood ratio test, (ii) a score test, and (iii) a Wald test evaluating the null hypothesis that the coefficient for `type` is zero. For each test, provide the test statistic and a p-value.
   g. Write a one- or two-sentence summary of your findings, that combines appropriate information from (b)-(f).
2. Is there a relationship between infection status at ICU admission (`infect`) and vital status at discharge, when adjusting for consciousness category (`conscious`) and whether or not CPR was performed (`cpr`)?
   a. Provide a short summary statement that answers the question (this should include a p-value and a confidence interval)
   b. Explain the choice of test you used to answer (a).
3. For this question, use the Myopia dataset introduced on Homework 3.
   a. Fit a logistic regression model for myopia status. Include age, indicator of sex, indicator of mom with myopia, indicator of dad with myopia, hours spent watching TV, and hours spent on the computer as the predictor variables.
   b. Provide an estimated adjusted odds ratio, and 95% CI, for myopia comparing (i) children with and without a mother with myopia, (ii) children with and without a father with myopia, and (iii) children who differ in age by one year. What can you conclude from these intervals?
   c. A colleague claims that watching TV or using a computer have no impact on myopia. Write out the equation for the logistic regression model in (a) and state the null (H_0) and alternative (H_A) hypotheses corresponding to your colleague's assertion.
   d. Test the null hypothesis in (c). Report your conclusion, including a p-value, in one or two sentences.