

Homework 9

Statistics 411/511: Spring 2018
Due: In class April 4

Do Exercise 24 on page 232 of your text where the respiratory rates for $n = 618$ children of different ages are considered. You must report your answers to this problem in the format according to the Syllabus and *Writing a Statistical Report* available on the course website. The report, not including the Appendix that contains your R-code and R-output and figures and any tables, should not exceed two pages. Your grade will be determined by how well you answer the questions and by the organization and clarity of your write-up. You must work with at least 2-3 classmates and submit a report as a group.

1. Plot the data and add informative x -axis and y -axis labels including units.
2. You will need to investigate a few different models (i.e., consider transforms of the response and/or predictor). Also consider including a quadratic term for Age. Be sure to indicate what models you investigated.
3. State all relevant assumptions and include any plots or other output that indicate that the final model you fit satisfies these assumptions.
4. Perform an extra sum of squares F -test to compare your regression model to the “null” equal mean model. Report the F statistic, p -value, and give a conclusion in terms of the problem.
5. Perform an extra sum of squares F -test to compare the regression models with and without the quadratic term. Report the F statistic, p -value, and give a conclusion in terms of the problem.
6. Indicate which of your analyses and checks above, and what other considerations, led you to choose your final “best” model.
7. Go back to the plot you generated in #1 and add a plot of the fitted best model using the `lines()` function. This plot is on the original scale of the data! Your plot will not be linear if you had to transform the data prior to fitting the model or if you added a quadratic term to your final model! Include a legend in your plot.
8. Report the R^2 for your final model.
9. Do the data suggest that respiratory rate is associated with Age? Report the relevant parameter estimate(s) and p -value(s) and 95% CI(s) that address this question.
10. If the answer to #9 is Yes, then how can this association be described? In other words, write out the model as $\text{Median}\{\text{Rate}|\text{Age}\} = \hat{f}(\text{Age})$ where \hat{f} is the fitted model that describes Rate as some (maybe non-linear) function of Age.
11. Do as your book asks: include a plot or chart that a physician could use to assess a normal range of *the individual* respiratory rates for children of any age up to 36 months. Clearly indicate what you are plotting.
12. EXTRA CREDIT: The normal respiration rate for an adult at rest is between 12 to 25 breaths per minute (as reported by Cleveland Clinic, <https://my.clevelandclinic.org/health/articles/10881-vital-signs>). Test whether the median respiratory rate for a 36 month old child is LARGER than 25 breaths per minute. Report the test statistic and the p -value.