# Week 8

Goal: There are two parts to these assignments. One is meant to be a capstone reflection on the semester. This is meant to provide feedback to the instructor as to the key takeaways students have which can inform future course design. It simultaneously celebrates students’ accomplishments, as the 8wk course is somewhat of a grueling pace, and students don’t often find time to reflect on how far they’ve come. Group celebration also fosters positive attitudes towards statistics.

The second part is meant to introduce students to linear regression models. Modelling is considered a conceptually distinct learning objective, and students build a basic fluency serving as a foundation for a second semester modelling-based course.

## Part 1

#### INTRODUCTION

In a study by Abdallah et al. (2011), one of the researchers' main study questions was related to which of the laryngoscopes facilitated faster intubation. This week we will examine total intubation time in more detail.

Familiarize yourself with the study data by reviewing the [Dataset Introduction](https://blackboard.gwu.edu/bbcswebdav/pid-11083961-dt-content-rid-64965615_2/xid-64965615_2), [Data Dictionary](https://blackboard.gwu.edu/bbcswebdav/pid-11083961-dt-content-rid-64965616_2/xid-64965616_2), and the [study paper](https://blackboard.gwu.edu/bbcswebdav/pid-11083961-dt-content-rid-64965617_2/xid-64965617_2).

Use the following cleaned dataset, which only includes patients with a successful first attempt intubation and good view (these variables are statistically significant covariates/confounders): [Laryngoscope - Macintosh group - Cleaned.csv](https://blackboard.gwu.edu/bbcswebdav/pid-11083961-dt-content-rid-64965624_2/xid-64965624_2)

The standard technique for assessing relationships between two quantitative variables is a correlation analysis, usually followed by a simple linear regression.

(1) Create a scatterplot for ease and total intubation time (set intubation time as the 'y' variable and on the vertical axis).

(2) Estimate the correlation between ease and total intubation time.

(3) What is the regression line predicting total intubation time from ease? Total\_Intubation\_Time = \_\_\_\_ + \_\_\_\_ \* Ease. (Hint: use the summary statistics for two quantitative variables tool in Statkey to get the intercept and the slope of the regression line).

(4) What percentage of the variation in total intubation time can be explained by this model? (Hint: Interpret the coefficient of determination, i.e., r-squared.)

(5) Conduct a randomization test for a correlation to assess whether the correlation between ease and total intubation time is statistically significant. Include a summary sentence stating your conclusion and include the p-value of the test.

Imagine the following scenario: There is a new obese patient that requires orotracheal intubation. We will try to predict how long this patients' intubation will take.

(6) What is the average total intubation time for all patients?

(7) The patient's ease is rated at 70. Use your regression equation from Part 1 to calculate a predicted total intubation time. What is your prediction? (show your work).

(8) Does knowing the patient's ease help make a better prediction for this patient's total intubation time than simply guessing the average for all new patients? Include the results of your hypothesis test for correlation and your interpretation of r-squared in your justification.

due **Sunday**: Submit a single .docx or .pdf file with your completed work, including screenshots of StatKey, written out equations, and explanations as appropriate.

## Part 2 – Extra credit

Use the information from Part 1 to answer the following questions. Attached is output from a statistical software program called R. It is the results from a multiple linear regression model aiming to explain the variation in total intubation time by using the other study variables. The model is for the entire study data. Use this output to answer the next two questions:  [wk8dbR.png](https://blackboard.gwu.edu/bbcswebdav/pid-11083967-dt-content-rid-64965640_2/xid-64965640_2)

(1) What percentage of the variation in total intubation time can be explained by this model and the other study variables?

The model output provides adjusted estimates that help us understand how various factors affect total intubation time. The interpretation for categorical variables and quantitative variables is slightly difference. In this question, we will focus on categorical variables. For example, we see that the estimate for RandomizationPentax is 13.08. This means that the Pentax group's average total intubation time is 13 secs more than the Macintosh group. Similarly, we see that the estimate for ASAstatus=3 is -0.34. This means that the ASAstatus=3 group's average total intubation time is 0.34 secs less than the ASAstatus=2 group.

(2) On average, how much faster is the total intubation time when the patient has a good view, compared to a poor view?

The estimates for quantitative variables can be interpreted as 'the change in total intubation time for every 1 increase in the quantitative variable'. For example, if a patient is 31 yrs old, it will take on average an extra 0.18 secs to intubate than a patient who is 30 yrs old. A patient who is 50 years old compared to a patient who is 30 years old, will take 20\*0.182 or 3.64 seconds longer to intubate on average because they are 20 years older.

(3) On average, how much slower is intubation on a patient with an ease of 100 (i.e. not easy) compared to a patient with an ease of 0 (i.e. very easy)?

due **Sunday**: Submit a single .docx or .pdf file with your completed work, including written out equations and explanations as appropriate.

## Reflection – Part 1

Reflect on what you have learnt this semester. Then, answer the following questions:

(1) What do you think are the 2-3 most important concepts you've learnt in this class?

(2) What was your most rewarding "ah-ha" moment in this class?

(3) How do you plan to use statistics in the future?

Post to the discussion board by **Thursday**.

## Reflection – Part 2

Respond to at least two other colleagues' posts. Answer any questions that your classmates or instructors ask about your post.

due **Sunday.**