

Week 8 Tutorial Questions

Part A – Chi-square test and Logistic regression using RStudio

A study was conducted to determine whether endovascular therapy in patients with stroke improves the likelihood of a favourable outcome relative to standard medical therapy. Patients were randomly assigned within 6 hours of the estimated onset of a stroke to receive either endovascular therapy or standard medical care. Information was recorded on the patients' Pre-stroke health, the time between the estimated onset of stroke and the commencement of treatment, and whether the patient experienced a favourable outcome at 90 days after the stroke.

Download the Stoke.CSV data from the Week 8 folder under Learning Resources.

The data contains the following variables:

Therapy	"Endovascular" or "Standard" medical therapy
Outcome	Favourable outcome ("Yes"/"No")
Time	Time between stroke and commencing therapy (in hours)
Prestroke	Prestroke health score (L0 – good health, L1 – minor health issues, L2 – major health issues)

- a) What proportion of patients in the Endovascular therapy group experienced a favourable outcome 90 days after the stroke?

- b) If there was no association between Pre-stroke health and therapy group, what is the expected count for the number of patients in the Endovascular therapy group with a Pre-stroke health score L1?

- c) The researchers want to test that the therapy groups are similar in terms of their pre-stroke health. What is the χ^2 statistic used to test for an association between Pre-stroke health score and therapy group?

- d) Ignoring any possible effect due to the therapy group, use logistic regression to determine the effect of time to therapy on the patient's outcome. Based on this, what is the estimated odds for a favourable outcome for the patient if the time between stroke and commencing therapy is 4 hours?
- e) Based on the estimated Logistic Regression Model, what is the estimated probability of a favourable outcome for the patient if the time between stroke and commencing therapy is 4 hours?

PART B – Sign Test and Signed Rank Test

The following table gives the stroke volume index (mL/beat/m²) for eight patients, suffering from chronic severe anemia, before and after a treatment designed to lower the stroke index:

Patient	1	2	3	4	5	6	7	8
Before treatment	109	57	53	57	68	72	51	65
After treatment	56	44	55	40	52	46	49	41

- a) Carry out a sign test to determine if there is any evidence that patients tend to have lower stroke volume index after the treatment.
- b) Carry out a signed-rank test to determine if there is any evidence that patients tend to have lower stroke volume index after the treatment. (If you encounter any ties then average the ranks between the tied values.) Do you get the same results as in (a)?

PART C – Revision

Substantial research has established that the effect of alcohol on the human body depends on the blood alcohol concentration (BAC). Blood alcohol concentration depends on many factors including the number of standard drinks, sex, and body mass (kg). A study assigned a target alcohol dosage (Low, Medium and High) to participants. The actual standard drinks consumed was recorded, along with the blood alcohol concentration (g/dL) from a urine sample after a fixed waiting period.

- a) The mean and standard deviations of the blood alcohol concentration for males and females are as follows.

Group	n	Mean (g/dL)	SD (g/dL)
Males	12	0.0632	0.0208
Females	9	0.0754	0.0224

Assuming population standard deviations are not equal, calculate the standard error of the difference in the sample BAC means.

- b) What is the t -statistic to test whether the population mean BAC is lower for males than for females?
- c) What are the degrees of freedom to be used to calculate the p -value (not using the Welch approximation)?
- d) What do you conclude for the test in part (b)?

Pard D: Discuss Research Project Grading Criteria