Exercises for the course

"An introduction to R"

Exercise session Statistics 2: Wednesday, March 11 2015

Exercise 1: In the rivers of Trinidad are the Guppys species *Poecilia reticulata* submitted to two different predators: the big and dangerous *Crenicichla alta* downstream and the smaller *Rivulus hartii* upstream. Evolutionary ecologists believe that the guppys offspring are smaller downstream. To test this hypothesis you will fly to Trinidad to weight new-born Guppies. How many Guppies should you weight in each part of the riverif the real difference is 0.4 mg and if you would like to show it with 5% significance? The flight costs are high so for it to be worth the power of the test should be 99%.
Hint: You know from previous studies that the standard deviation will be about 0.5 mg.
Imagine you had decided to measure 20 guppies per river part. What will be the power of your test?

Exercise 2: We want to test the hypothesis that teeth enamel can be dammaged due to the chlorine present in the water from public swimmingpools.
We have tested the enamel dammage for 200 swimmers that train more or less than 6 hours a week.

	Enamel dammaged		
Weekly training duration	Yes	No	Total
more than 6 h	29	71	100
less than 6 h	19	81	100
Total	48	152	200

a) Do this dataset support the hypothesis stated? Formulate a null-hypothesis and test it using an appropriate test. What is your conclusion?

b) Imagine we get analogous results for a double sample size.
We would have observed 200 frequent swimmers and 200 less-frequent swimmers and found enamel dammage in 58 and 38 swimmers respectively.
What would then be the value of the test statistic and what would be your conclusion?

Exercise 3: The built-in data set `Puromycin` shows the reaction velocity versus substrate concentration in an enzymatic reaction involving untreated cells or cells treated with Puromycin. Load this dataset and have a look at it to see if the variables are continuous or ordinal. Apply an appropriate test to investigate the relation between the variables `conc` and `rate` for the treated and untreated cells.
Formulate your answer.