Homework 4

Biol 607

September 26, 2014

1) Probability distributions: Plot a chi-squared distributino with 5 degrees of freedom. Visually show it's 75% and 99% confidence intervals. You can use **plot** and **polygon** for this, or futz with different geoms in **ggplot2**, such as**geom_area**. You'll also need to dig into a few different functions relating to the chi-squared distribution itself, and you might find the **seq** function of some use.

1.1) Extra credit (10 points): Do the same with a discrete geometric distribution with a probability of 0.3. Notice anything funny? Explain.

2) P-Values from W&S (10 Points) Complete problems 20 & 27 on pg. 171-173 of Whitlock & Schluter. When possible, compare values obtained from tables (the old school way) to values generated by R.

3) Power (5 Points for each part) Sally the scientist has decided to get into drug development! She thinks that she has struck on a whopper of a drug that will cure bad breath! Forever! She begins testing in mice that have been bred to have breath so bad that it causes flowers to wilt. She injects 20 mice with her drug, waits a few days, and puts a flower in each of their cages overnight. Around mice with bad breath, previous studies have shown that 80% of flowers wilt. Sally observed 13 flowers wilting overnight.

a) Assuming an alpha of 0.05, what did her experiment show?

b) A 15% reduction in wilting is great, but Sally is worried about power. If her drug reduces flower wilting from 80% to 65%, what is the power of her test, based on the description of the experiment and using an alpha of 0.05? Use 5000 simulations.

And a fun fact that I glossed over in class, TRUE in R is equivalent to 1. FALSE is equivalent to 0. So, TRUE + TRUE + FALSE = 2. Neat, huh? Also, if you ask if a vector is greater than or less than a value, the comparison will be applied across the entire vector. Try c(1,2,3)<2 to see what I mean

c) How might her results have changed with a different alpha? Plot it. Remember, to get vectors that are not just integers, seq is the way to go.

seq(from = 0, to = 1, .1) produces

[1] 0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0

d) Do you feel confident in Sally's conclusion that her drug worked? Why or why not?

e) Extra credit - 10 points A final idea might be to look at how sample size and effect size could have changed her conclusions. Sticking with an alpha of 0.05, is there a range of effect and sample sizes where you would feel confident that her test has adequate power? How many mice would she need for different effect sizes?

Note, here her effect size was a reduction in wilting from 0.8 to 0.65. So, a 15% reduction in wilting. You can show your results graphically and/or numerically.

Note, you might want to utilize the expand.grid function and work with data frames. Stick with 5000 as your number of simulations for any power calculation.