

# STAT 205, Spring 2015

## Homework 8

Out: Thursday April 14. Due in: Thursday April 23. Note: this is an optional homework. If the grade for this homework is higher than the lowest previous homework grade, the lowest grade will be replaced by this grade.

- 9.2.5(a,b) use `binom.test` in R; show your code.
- 10.2.4 use `fisher.test` in R to obtain the P-value; show your code. You do not need to make a table (as requested in part c) and do not need to show a test statistic (as requested in part d).
- 10.5.2 (a) use `chisq.test` in R to compare the sex ratios at the three sites; show your code.
- 10.7.1 construct and interpret the interval using `prop.test` in R. Show your code.
- 10.9.6(a,b), also report P-value from formal test  $H_0 : \theta = 1$ ; is phenylpropanolamine related to stroke? Use `fisher.test` in R; show your code.
- Radish growth (pp. 55-56): Does light exposure alter initial radish shoot growth?  $n = 42$  radish seeds were randomly assigned to one of three growing conditions:  $n_1 = 14$  were germinated in complete darkness,  $n_2 = 14$  were grown in diurnal light (12 hours of light followed by 12 hours of dark), and  $n_3 = 14$  were grown in complete light. At the end of three days, each shoot length was measured in millimeters (mm). The data are available under the Chapter 11 data link from the course web page (Example 2.5.3).
  - Prepare side-by-side boxplots. Which growing condition produces the longest shoots, which produces the shortest?
  - Define three population means  $\mu_1, \mu_2$ , and  $\mu_3$  for the three growing conditions.
  - Carry out the analysis of variance for these data in R, show your R code and output including the ANOVA table.
  - What is the P-value for testing  $H_0 : \mu_1 = \mu_2 = \mu_3$ ? Do you accept  $H_0$  or reject  $H_0$  at the 5% level?

**9.2.5** To evaluate the policy of routine vaccination of infants for whooping cough, adverse reactions were monitored in 339 infants who received their first injection of vaccine. Reactions were noted in 69 of the infants.<sup>9</sup>

- Construct a 95% confidence interval for the probability of an adverse reaction to the vaccine.
- Interpret the confidence interval from part (a). What does the interval say about whooping cough vaccinations?

**10.2.4** Most salamanders of the species *P. cinereus* are red striped, but some individuals are all red. The all-red form is thought to be a mimic of the salamander *N. viridescens*, which is toxic to birds. In order to test whether the mimic form actually survives more successfully, 163 striped and 41 red individuals of *P. cinereus* were exposed to predation by a natural bird population. After two hours, 65 of the striped and 23 of the red individuals were still alive.<sup>3</sup> Use a chi-square test to assess the evidence that the mimic form survives more successfully. Use a directional alternative and let  $\alpha = 0.05$ .

- State the null hypothesis in words.
- State the null hypothesis in symbols.
- Compute the sample survival proportions for each group and display the values in a table similar to Table 10.1.2.
- Find the value of the test statistic and the  $P$ -value.
- State the conclusion of the test in the context of this setting.

**10.5.2** For a study of free-living populations of the fruit-fly *Drosophila subobscura*, researchers placed baited traps in two woodland sites and one open-ground area. The numbers of male and female flies trapped in a single day are given in the table.<sup>31</sup>

	WOODLAND SITE I	WOODLAND SITE II	OPEN GROUND
Males	89	34	74
Females	31	20	136
Total	120	54	210

**10.7.1** Elderly patients who had suffered hip fractures were randomly assigned to receive either a placebo ( $n = 1,062$ ) or zolendronic acid ( $n = 1,065$ ) in a double-blind clinical trial. During the trial 139 placebo patients and 92 zolendronic acid patients had new fractures.<sup>45</sup> Let  $p_1$  and  $p_2$  represent the probabilities of fracture on placebo and zolendronic acid, respectively. Construct a 95% confidence interval for  $(p_1 - p_2)$ .

**10.9.4** Consider the data from Exercise 10.9.3.

- Calculate the sample value of the odds ratio.
- Construct a 95% confidence interval for the population value of the odds ratio.
- Interpret the confidence interval from part (b) in the context of this setting.

**10.9.5** As part of the National Health Interview Survey, occupational injury data were collected on thousands of American workers. The table below summarizes part of these data.<sup>55</sup>

		SELF-EMPLOYED	EMPLOYED BY OTHERS
Injured?	Yes	210	4,391
	No	33,724	421,502
	Total	33,934	425,893

- Calculate the sample value of the odds ratio.
- According to the odds ratio, are self-employed workers more likely, or less likely, to be injured than persons who work for others?
- Construct a 95% confidence interval for the population value of the odds ratio.
- Interpret the confidence interval from part (b) in the context of this setting.

**10.9.6** Many over-the-counter decongestants and appetite suppressants contain the ingredient phenylpropanolamine. A study was conducted to investigate whether this ingredient is associated with strokes. The study found that 6 of 702 stroke victims had used an appetite suppressant containing phenylpropanolamine, compared to only 1 of 1,376 subjects in a control group. The following table summarizes these data.<sup>56</sup>

		STROKE	NO STROKE
Appetite suppressant?	Yes	6	1
	No	696	1,375
	Total	702	1,376

- Calculate the sample value of the odds ratio.
- Construct a 95% confidence interval for the population value of the odds ratio.
- Upon hearing of these data, some scientists called the study “inconclusive” because the numbers of users of appetite suppressants containing phenylpropanolamine (7 total: 6 in one group and 1 in the other) are so small. What is your response to these scientists?

**10.9.7** Two treatments, heparin and enoxaparin, were compared in a double-blind, randomized clinical trial of patients with coronary artery disease. The subjects can be classified as having a positive or negative response to treatment; the data are given in the following table.<sup>57</sup>

		HEPARIN	ENOXAPARIN
Outcome	Negative	309	266
	Positive	1,255	1,341
	Total	1,564	1,607

- Calculate the sample value of the odds ratio.
- Construct a 95% confidence interval for the population value of the odds ratio.
- Interpret the confidence interval from part (b) in the context of this setting.

**10.9.8** Consider the data from Exercise 10.7.1. Given that there were 139 hip fractures in 1,062 placebo patients and 92 hip fractures in 1,065 zoledronic acid patients, construct a 95% confidence interval for the population value of the odds ratio.<sup>45</sup>