Introduction to Biostatistics (BIOS 4120)
Breheny

Quiz 1 (Practice)

1. (17 points) A study published in the *British Medical Journal* compared the effectiveness of two approaches for the treatment of kidney stones. Investigators randomly selected 700 operations performed in the previous decade, recording the type of procedure, outcome, and patient characteristics. Two types of procedures were open surgery (OS) and percutaneous nephrolithotomy (PN). The number of successful surgeries, along with the total number of surgeries, for these two procedures are listed below, broken down by the size of the patients' kidney stones (a "small" stone being defined as less than 2 cm in diameter).

	Small stones		Large stones	
	Successful	Total	Successful	Total
Open surgery	81	87	192	263
Percutaneous nephrolithotomy	234	270	55	80

(a) Is this a controlled experiment or an observational study?

(b) Which type of procedure has the higher overall success rate?

(c) Which type of stone (large vs. small) has the higher overall success rate?

(d) Are open surgeries more likely to be performed on small stones or large stones? Or are they equally likely to be performed on either type of stone?

(e) Is the comparison you made in part (b) subject to confounding? If so, what is the confounding factor?

(f) If a randomized controlled trial were performed comparing open surgery and percutaneous nephrolithotomy, which procedure would you expect to have the higher overall rate of success? Or would the overall success rates be the same?

2. (3 points) Suppose an investigator conducts a telephone survey of individuals randomly chosen from the phone book. Such an experimental design, however, excludes subjects who use a cell phone only (*i.e.*, they do not pay for a landline and are therefore not in the phone book). The investigator's results are subject to what kind of flaw?

3. (5 points) Suppose that a funding agency gives out 200 grants to different researchers to carry out various studies, and that 80 of those studies obtain statistically significant results. Of the 80 studies with statistically significant results, 10 were actually due to random chance. Of the 120 without statistically significant results, 30 investigators were actually studying meaningful differences which were not due to chance.

(a) How many type I errors were made?

(b) What was the type II error rate?