Unit 1 GROUP ASSIGNMENT: Simulation Methods

Source: Allan Rossman: http://www.rossmanchance.com/applets/ChiSqShuffle.html?yawning=1

Situation: Dr. Flipper

Swimming with dolphins can certainly be fun, but is it also therapeutic for patients suffering from clinical depression? To investigate this possibility, researchers recruited 30 subjects aged 18-65 with a clinical diagnosis of mild to moderate depression. Subjects were required to discontinue use of any antidepressant drugs or psychotherapy four weeks prior to the experiment, and throughout the experiment. These 30 subjects went to an island off the coast of Honduras, where they were randomly assigned to one of two treatment groups. Both groups engaged in the same amount of swimming and snorkeling each day, but one group (the animal care program) did so in the presence of bottlenose dolphins and the other group (outdoor nature program) did not. At the end of two weeks, each subjects' level of depression was evaluated, as it had been at the beginning of the study, and it was determined whether they showed substantial improvement (reducing their level of depression) by the end of the study (Antonioli and Reveley, 2005).

1) Were subjects in this study randomly selected from a population? Were subjects randomly assigned to groups?

   Random selection? _____ (yes or no) Random assignment? _____ (yes or no)

The researchers found that 10 of 15 subjects in the dolphin therapy group showed improvement, compared to 3 of 15 subjects in the control group. Organize these results in the following 2x2 table:

	Dolphin Therapy	Control Group	Total
Showed improvement			
Did not show improvement			
Total			30

2) Calculate the *conditional proportions* of subjects who improved in each group. That is, what proportion of subjects in each group showed improvement?

   Proportion in the dolphin group showing improvement = _____

   Proportion in the control group showing improvement = _____

3) Let's assume a null model is true. That is, let's assume the dolphin therapy had no impact on improvement (in other words, we have 13 subjects who would have shown improvement regardless of which group they were assigned to). If this assumption is true, how likely were we to have observed 10 or more subjects in the dolphin therapy group showing improvement? Briefly describe the process you used to estimate this likelihood. Based on your estimation, do you think dolphin therapy is beneficial? Did you find a statistically significant difference between the dolphin therapy and control groups?

   Note: You can choose to use the website listed at the top of this assignment or you can calculate this probability directly.

Situation: Nurse Gilbert

For several years in the 1990s, Kristen Gilbert worked as a nurse in the intensive care unit (ICU) of the Veteran's Administration hospital in Northampton, Massachusetts. Over the course of her time there, other nurses came to suspect that she was killing patients by injecting them with the heart stimulant epinephrine. Part of the evidence against Gilbert was a statistical analysis of more than one thousand 8-hour shifts during the time Gilbert worked in the ICU (Cobb and Gelbach, 2005). Here are the data:

	Gilbert working on shift	Gilbert not working on shift	Total
Death occurred on shift	40	34	74
Death did not occur on shift	217	1350	1567
Total	257	1384	1641

4) Were deaths more likely to occur on shifts that Gilbert was working than on shifts when she was not? Show the proportions you used to answer this question.

5) Suppose you're an attorney defending Gilbert. Could you use the "random chance" argument for her defense? Is it possible that deaths are no more likely on her shifts; that it was just the "luck of the draw" that resulted in such a higher percentage of deaths on her shifts?

In an attempt to answer this question, try the applet at:
http://www.rossmanchance.com/applets/ChiSqShuffle.html?dolphins=1.

Fill-in the 2x2 table at the top of the page, check the "show shuffle options box," uncheck the animate box, and try 1000 replications.

You could also try this applet: http://lock5stat.com/statkey/randomization_2_cat/randomization_2_cat.html

Click "Edit Data" at the top, enter in the data from this study, click to generate thousands of samples, and then click the tail of interest.

Based on the resulting graph, write out your conclusions.