**Chapter 4.2: Inference for Experiments ACTIVITY**

To see if fish oil can help reduce blood pressure, 14 males with high blood pressure were recruited and randomly assigned to one of two treatments. The first treatment was a four-week diet that included fish oil, and the second was a four-week diet that included regular oil. At the end of the four weeks, each volunteer’s blood pressure was measured again and the reduction in diastolic blood pressure was recorded. The results of this study are shown below. Note that the negative value means that the subject’s blood pressure *increased.* [Source: *New England Journal of Medicine,* 320 (1989), pp.1037-1043; cited in Fred Ramsey and Daniel Schafer, *The Statistical Sleuth,* Duxbury Press, 2002, p. 23.]

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| **Fish oil:** | 8 | 12 | 10 | 14 | 2 | 0 | 0 | $$\overbar{x}\_{f}=6.57$$ | $$\overbar{x}\_{f}-\overbar{x}\_{r}=7.71$$ |
| **Regular oil:** | -6 | 0 | 1 | 2 | -3 | -4 | 2 | $$\overbar{x}\_{r}=-1.14$$ |

**Question:** Is there convincing evidence that fish oil is better than regular oil for reducing diastolic blood pressure? In other words, is the difference in mean reduction statistically significant?

To find out, let’s see what would happen if we randomly assign the 14 people in the experiment to two groups many times, *assuming the two treatments have the same effect on blood pressure.* We will conduct a *simulation* of the study to see if the results happened by chance or if they are more meaningful than chance alone.

* Write each person’s reduction in blood pressure on separate but equally sized slips of paper.
* Shuffle the papers and deal two piles of 7 each. The first pile will represent the fish oil group and the second pile will represent the regular oil group. Calculate the mean for each group and then find the difference in means ($\overbar{x}\_{f}-\overbar{x}\_{r}$).
* Repeat this process many times and make a class dotplot of the simulated differences in means.

Class dotplot of the simulated difference in means between the fish oil and regular oil groups:

**Back to our question:**

* How often did you get a difference in means of 7.71 or more? In other words, is the difference in means recorded in the actual study so unusual it can’t just have happened by chance? Explain (in your own words).
* Is there convincing evidence that fish oil is better than regular oil for reducing diastolic blood pressure? Explain (using proper AP exam terminology and complete sentences).
* Can an “unlucky” random assignment lead to confounding?
	+ What are potential lurking variables?
	+ Do you think the study results might be affected by these lurking variables? In other words, do you think the recorded greater improvement in blood pressure among the fish oil group could have been due to something else? Why/why not?