ACTIVITY 12

FISH OIL

# DIRECTIONS

Have one group member upload this docx file to your Google Drive and share it with your groupmates and your instructor. Name your document “**GroupX\_Activity12”** (where X is your group number). Work together to type up your responses to each question. Download your document as a PDF and submit this to Canvas individually.

# INTRODUCTION

Polyunsaturated fats have been suggested to lower blood pressure and therefore may assist in the treatment of hypertension. To test this, researchers designed a study to investigate the effects of oil supplements in the diets of individuals with hypertension. Researchers conjectured that those supplementing their diet with fish oil would tend to experience greater reductions in blood pressure than those supplementing their diet with regular oil, since fish oil is high in polyunsaturated fats.

Researchers randomly assigned 28 male volunteers with high blood pressure to one of four four-week diets:

* 10 ml of fish oil (3 or 15 g of n–3 fatty acids) daily (**Low dose fish oil**)
* 50 ml of fish oil (3 or 15 g of n–3 fatty acids) daily (**High dose fish oil**)
* 50 ml of safflower oil (39 g of n–6 fatty acids) (**Safflower oil**)
* 50 ml of a mixture of oils that approximated the types of fat present in the American diet (**Regular oil**)

In this activity, we will investigate the differences in means among more than 2 groups, and answer the following research question:

Is there evidence that these four oil dietary supplements have different effects on reducing blood pressure?

# PART 1 – DETERMINING OVERALL DIFFERENCES

## BRAINSTORMING

We’d like a way to compare these different oils, but to use the methods we’ve learned so far, we would need to make ***6*** ***different comparisons***, as we have only learned so far how to compare two groups at a time.

1. In previous contexts, we’ve only had two groups to compare. For this scenario with four groups, how would we state our null hypothesis?
2. To assess the differences between two groups of numerical data (like the Memorization activity), we analyzed and collected statistics on a difference in means. Can we use this approach now with comparing four groups? What ideas on measures/statistics do you have in order to measure overall differences in this multi-group comparison scenario?

## INVESTIGATING THE DATA

1. Create a plot of **all** the patients’ reductions in blood pressure and paste it below. What is the average blood pressure reduction for these 28 patients, regardless of their oil supplement?
2. Now separate the dots in the plot by their oil supplement group, showing the averages for each group. Paste that plot below.
3. How do the means in each group from the plot above compare to the overall mean you found in question 3?

## CONSIDERING RANDOMNESS

1. Do you think that these differences between each of the group means and the overall mean could have occurred just by random chance? Or do you think this represents evidence that there are differences in blood pressure reduction among the four oil supplement groups? Explain your intuitions and reasoning.
2. Based on your response to the previous question, fill out the table below in one of two ways:
   * 1. If you believe that the means in your plot in question 4 are just a product of random chance, fill in the table below with an example of group means that would be convincing evidence that there are differences among the groups.
     2. If you believe that these means from your plot in question 4 are convincing evidence that the groups are different in terms of blood pressure reduction, then fill in the table below with group means that would represent what could have been produced by random chance.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **HD Fish** | **LD Fish** | **Safflower** | **Regular** |
| **Mean** |  |  |  |  |

## CHOOSING A STATISTIC

1. In order to truly evaluate how different these means are from each other, we will need to calculate and collect on a *single* statistic that measures ***how different the means are collectively*** and build a sampling distribution of those statistics. In your groups, brainstorm different measures/statistics that you could use to evaluate how different these four oil supplement groups are. For each measure you create, apply it to the data given to you in TinkerPlots and report that resulting value.
2. Compare the statistics/measures you created to ones that other groups made (as presented in class discussion), and discuss the similarities and differences among these approaches.

# PART 2 – MODELING AND TESTING THE FISH OIL DATA

1. Create a TinkerPlots model that simulates what might happen in this study under your null hypothesis in question 1. As part of your modeling, answer the following questions:
   1. Copy and paste a picture of your TinkerPlots sampler below.
   2. State what the repeat/draw values are set to, and explain why they are set to those values.
   3. Describe if the device(s) in your sampler are set to sample with or without replacement and explain why. How does this connect to the design/type of study conducted?
   4. Describe what elements you used to populate the device(s) in your sampler and why.
   5. What labels did you give the devices/attributes in your sampler? What do those labels represent?
   6. Describe what process your sampler is modeling when you click run and how this relates to the problem context. What kinds of outcomes will your sampler produce?
2. Run a single trial of your sampler and make a plot of the results that allows you to see the mean blood pressure reduction for each group. Copy and paste this plot below and interpret what a dot in the plot represents.
3. How does your plot compare to the plot you made of the real data in question 4? What does this imply about the research question?
4. Based on the statistic you derived in question 8, run 500 trials of your simulation and create a sampling distribution for that statistic. What does a dot in this plot represent? What is the overall shape of this distribution? (e.g. symmetric, skewed left/right)
5. When investigating these different statistics to measure overall differences between groups in question 8, we also computed what the value of this statistic would be for the original data. Using this result with your sampling distribution, find the *p*-value.
6. Based on your *p*-value, what does this indicate about your evidence against the null hypothesis? What response would you have to our original research question?