

Student Page: Exercise and Cholesterol Level

Part I:

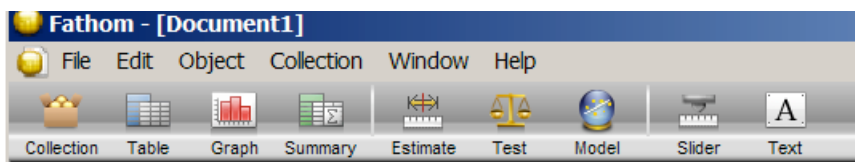
Studies show that high cholesterol is a risk factor for heart disease. Table 1 lists data from a study investigating the effect of exercise on cholesterol levels. Twenty-four hospital employees voluntarily went to a gym to exercise for one hour per day, three times per week. The data show their cholesterol levels both before and after the four months of exercise, in milligrams of cholesterol per deciliter of blood (mg/dL). Suppose for the activities that it is always desirable to decrease the level of cholesterol in the blood. Thus, assume that the purpose of the exercise was to decrease that level.

Table 1: Cholesterol Levels of 24 employees before and after the four months of exercise

Before (mg/dL)	After (mg/dL)	Before (mg/dL)	After (mg/dL)
195	146	169	182
145	155	158	127
205	178	151	149
159	146	197	178
244	208	180	161
166	147	222	187
250	202	168	176
236	215	168	145
192	184	167	154
224	208	161	153
238	206	178	137
197	169	137	125

EXERCISE AND CHOLESTEROL

1. Drag a case table from the shelf as in Figure 1.



New Case Table

Figure 1

2. Enter data from the exercise sheet using **Before** and **After** as attributes as in Figure 2a.
3. Create a new attribute, **Difference**, by typing its name where you see the <new> column heading. Then press enter.

- To create the formula for **Difference**, select the column and choose Edit>Edit Formula from the menu bar. The formula editor appears; enter **After – Before** and then press **OK** to close the editor as in Figure 2b.

Cholesterol Levels

	Before	After	<new>
=			
1	195	146	
2	145	155	
3	205	178	
4	159	146	
5	244	208	
6	166	147	

a.

Cholesterol Levels

	Before	After	Difference
=			
1	195	146	-49
2	145	155	10
3	205	178	-27
4	159	146	-13
5	244	208	-36
6	166	147	-19
7	250	202	-48
8	236	215	-21
9	192	184	-8

b.

Figure 2

- In the context of the problem, what do the positive differences represent?
 - What do the negative values represent?
- To create a dot plot of the difference, pull down a new graph from the shelf. Drag the name of the attribute **Difference** to the horizontal axis as in Figure 3.

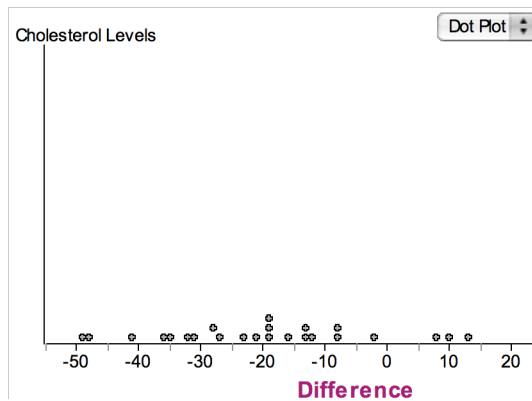


Figure 3

- Drag a new graph off the shelf; drag the name of the attribute **Difference** to the horizontal axis. Change from Dot Plot to Histogram as in Figure 4.

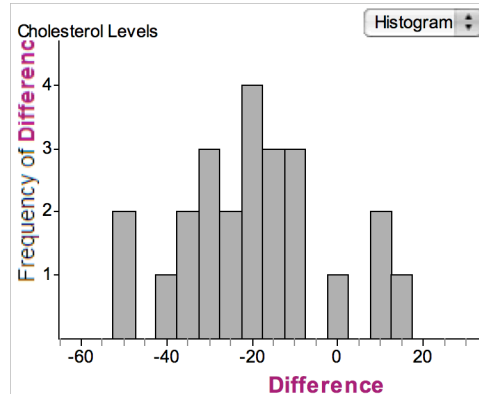


Figure 4

7. Drag a new graph off the shelf; drag the name of the attribute **Difference** to the horizontal axis. Change from Dot Plot to Box Plot as in Figure 5.

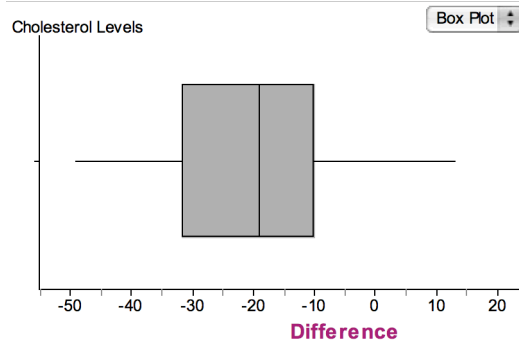


Figure 5

Part II.

Student Questions:

8. For each of the following, which graph would you choose to answer this question and why?
- What are the minimum and maximum values? What do these values represent in this situation?
 - What is the spread?
 - What is the shape?

- d. Estimate the percentage of volunteers who saw a decrease in their cholesterol level.
- e. What is the shape of the distribution?
- f. What is the center?

Part III.

Fathom Simulation:

1. Drag a new case table from the shelf. Create a new attribute **Result**, choose the Edit>Edit Formula. The formula editor appears; enter **randompick(“gain”, “lose”)**. Choose ok. Choose Collection>New Cases, 24. (See Figure 6.)

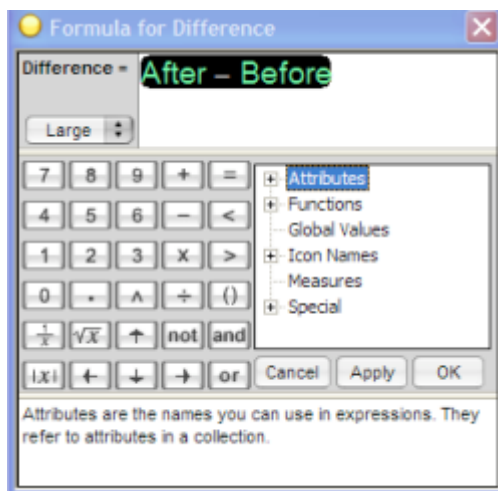


Figure 6

2. Expand the collection box to show individual cases. (See Figure 7)

Collection 1

	Before	After	Differen...
1	195	146	-49
2	145	155	10
3	205	178	-27
4	159	146	-13

Figure 7

3. Drag a graph from the shelf. Drag **Result** to the horizontal axis. For this random sample, did most show an increase or decrease in cholesterol. Rerandomize cases. How did the results change? Repeat this process several times. (See Figure 8.)

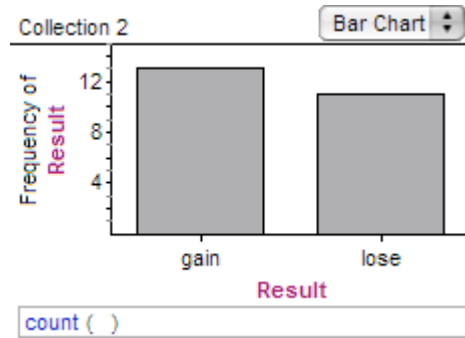


Figure 8

- Double click the collection to bring up the Inspector, choose measures and define a new measure **decrease**. Click on the 'Formula' cell for **decrease** and enter **count(result = "lose")**. Choose ok. This defines a measure that counts the number of volunteers who show a decrease in cholesterol. (See Figure 9.)

	Result	Decrease
=	randomPick ("gain", "lose")	count (Result = "lose"
1	gain	15
2	gain	15
3	lose	15
4	gain	15
5	lose	15

Figure 9

- Expand the 'Measures from collection' box; there are five measures. With the collection selected, choose Collection>collect measures. In the Measures from Collection>, double click the first case, go to display. At 'Captions' edit the formula to show **Decrease**. This will display the number out of 24 who experienced a decrease in their cholesterol. (See Figure 10.)

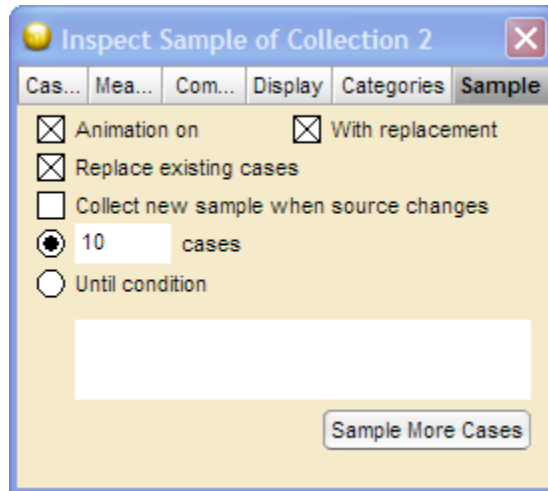


Figure 10

6. Click on 'collect more measures'. It will now show 10 counts. Of these 10, how many show a decrease in 21 or more volunteers?
7. Double click the 'measures from collection' collect measures, animation off, replace existing cases, collect 100 measures. Of these 100, how many show a decrease in 21 or more volunteers?
8. Collect 1000 measures, how many show a decrease in 21 or more volunteers? What does this result tell you about the results of the study?
9. Think about how the study was designed. How could you improve on the design to make the results more reliable?