

Dissolved Oxygen in the Hudson River

Part 1: Hypothesis

A research hypothesis is a proposed explanation of a phenomenon, based on data and facts. Your job in this part of the project is to come up with a hypothesis for the research questions presented in the box below. Follow the guidelines in the “Assignment” section when answering preparing your answer.

Research Questions:

- a) How do the dissolved oxygen levels in the New York Harbor change over the course of the year?
- b) What causes these changes, and why are they important?

Assignment: *provide at least a ½ page (typed) including the following information:*

1. Why is dissolved oxygen in water important?
2. What is the New York safe fishing standard for dissolved oxygen?
3. What do you predict the relationship is between oxygen levels and time of year in the Hudson River is?
4. Explain WHY you think that.
5. You must provide at least **TWO** sources as part of your answer.

Need Help Getting Started? Here are some suggested sources for background reading:

- Basics of Dissolved Oxygen in Water:
<http://water.usgs.gov/edu/dissolvedoxygen.html>
- State of the NY Harbor Report:
<http://www.nyc.gov/html/dep/pdf/hwqs2012.pdf>
- New York Water Quality Standards:
http://www.nyc.gov/html/dep/html/news/hwqsfeature_wide.shtml

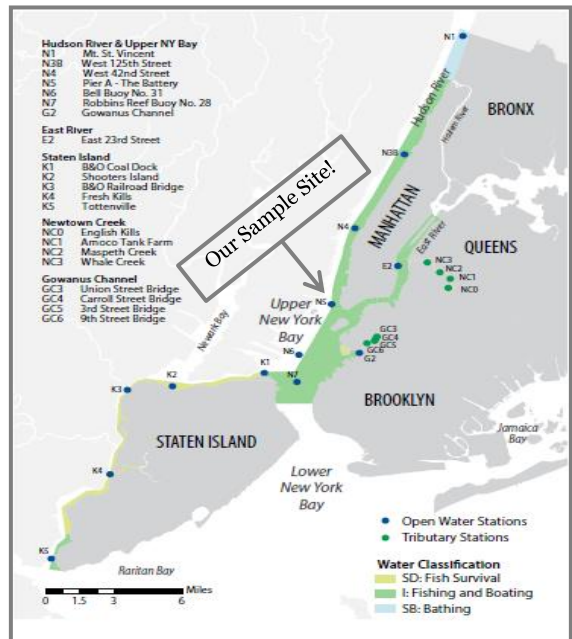
Part 2: Methods- Data and Planning

Step 1: Review the data!

Take a minute to look at the data below. We have many monthly sample values for dissolved oxygen at station N5 in the Hudson River; and average monthly temperature data for NYC as a whole.

* note: months are listed as numbers where 1=Jan., 2=Feb., etc.

Water Quality Data for Station N5 in the Hudson River (data from NYC Open Data)	
Sample Month	Dissolved Oxygen (unit: mg/L)
1	10.25
1	10.6
1	7.66
2	11.08
3	11.18
4	8.23
4	8.14
5	7.54
5	7.66
6	6.97
6	6.93
6	7.3
6	6.51
7	6.87
7	6.16
8	5.41
8	6.66
8	4.57
8	5.16
9	5.26
9	5.52
9	5.13
9	6.7
10	6.22
10	6.14
11	9.22
11	8.15
11	8.67
12	9.44
12	9.88



NYC Average Climate Data (Data from National Weather Service)	
Month	Average Temperature
1	32
2	34
3	43
4	50
5	62
6	72
7	78
8	77
9	70
10	57
11	47
12	38

Part 2: Methods- Data and Planning

Step 2: Make a Data Plan!

Assignment: *We are making a plan for how to best analyze our data- will are not actually going to do the math yet...that comes later! For now, review the data presented and provide at least a ½ page (typed) paragraph containing the following information:*

* HINT: Remember, you need to analyze this data in a way that will help you to prove or disprove the hypothesis you made in part 1.

1. The monthly temperature data is given as average values; however, there are many dissolved oxygen data values given for each month. What do you think is the best way to make these data sets comparable?
2. You will need to make a chart or graph of the data presented. Which **chart type** (bar graph, scatter plot, pie chart, etc.) do you think will help you best analyze this data? Explain your choice for chart type.
3. List **THREE basic statistics** (average, range, minimum, maximum, etc.) that you think would help you better understand your data.
 - Here are some examples of some basic statistics that may be helpful; you may up to two use these examples, but you must provide at least **ONE** additional idea of your own.
 - What is the range of oxygen values?
 - What month has the minimum temperature?
 - On average, are the dissolved oxygen values above or below the NYC standard?
4. List **THREE number transformations** (fractions, percentage, etc.) that would help you to make sense out of your data.
 - Here are some examples of some number transformations that may be helpful; you may use up to two these examples, but you must provide at least **ONE** additional idea of your own.
 - What percent of months have a dissolved oxygen value above the NYC standard?
 - What fraction of months have dissolved oxygen values above 8mg/L?
 - Rank the months of the year in order of lowest to highest dissolved oxygen, which months fall in the bottom half?

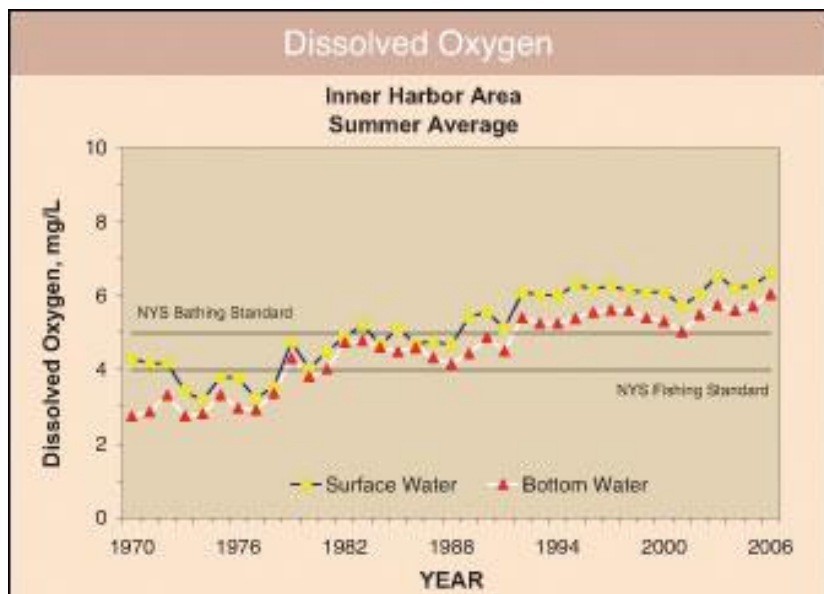
Part 3: Data Analysis and Results

Assignment: DO THE MATH! Using your data plan, provide at least 1 page (typed) including the following information.

1. Provide a chart (drawn or made on a computer) that best displays your data.
2. Explain the basic trends we can gather from this chart(1-3 sentences)
3. Provide at least three basic statistic that describes your data
4. Explain what the statistic(s) are telling us about the data (1-3 sentences)
5. Provide at least three number transformation that helps to make sense of your data
6. Explain how this number transformation helps put your numerical data in context (1-3 sentences)

Getting ready for the next steps:

Here is a Graph from NYC Dept. of Environmental Conservation that you may be able to compare to yours. Hint: This can be useful even if you made a different type of graph.



Want to see what other researches have done with similar data? Check out the **State of the New York Harbor Report** ([click here](#)).

Part 4: Conclusions

Assignment: *provide at least 1 page (typed) including the following information:*

1. Restate your hypothesis from part 1.
2. Did the data analysis support your hypothesis?
3. Which method (chart, statistics, number transformation) was the most helpful in determining your conclusion? Why?
4. Do your findings match what other researchers have found (you'll need at least **TWO** sources to show this- you can use the same sources you used to make your hypothesis).
5. Can you think of another data source or methodology that would help you to add further to this research?
6. What did this project teach you about quantitative reasoning?

★ **KEEP CALM AND REASON ON!** ★

Data not working out? KEEP CALM! Remember, the point of this project is to build your quantitative reasoning skills, not to necessarily be "right" about everything. Here are some tips to help you through some common data "freak outs":

...Your hypotheses was wrong- it's OK!! Double check your math to be sure that your calculations are correct, and use this week's assignment to report on what you have learned.

...Your data does not match what other researchers have found. Don't Freak Out!! Again, double check your calculations and report on what YOU have found. Point out some potential reasons your data may not match.

...You think you chose the wrong data plan (graphs, stats, etc.). Keep Breathing!! This is the section of the paper where you get to explain what you would add to this project or do differently if you were to do the project again. If you think your data plan choices were incorrect, this is your chance to explain yourself- and if your really brave- give it another try!