

Beach Bacteria

Scenario:

The health department has taken a random sample of 100 water samples near a popular beach on Lake Michigan. Your job is to analyze this data and determine if the beach is safe for swimming. Below is a table that shows the count of fecal coliform bacteria per 100mL water sample. If the majority of the fecal coliform bacteria counts are below 200 then the beach is safe for swimming.

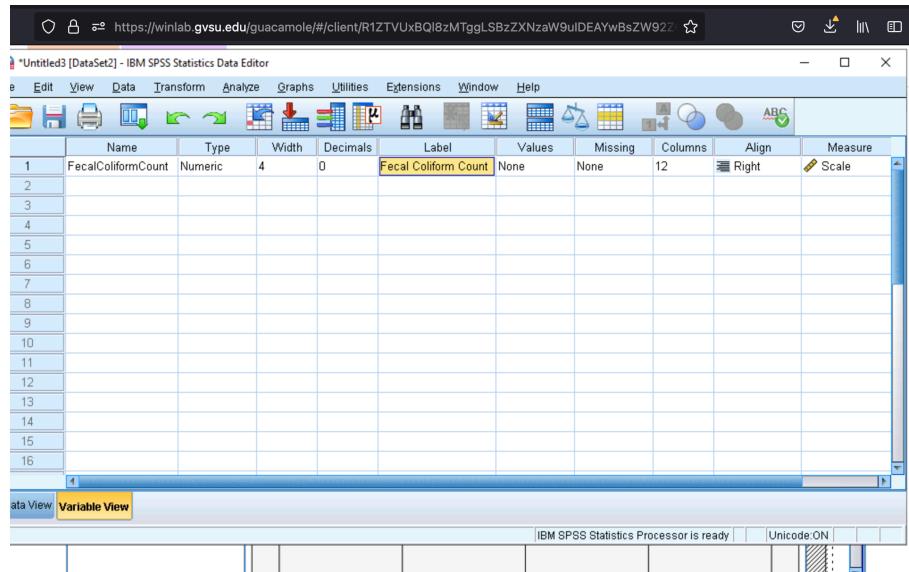
Research Question:

Is the beach safe for swimming? Essentially this question is asking us if the fecal coliform counts are less than 200 on average.

Task:

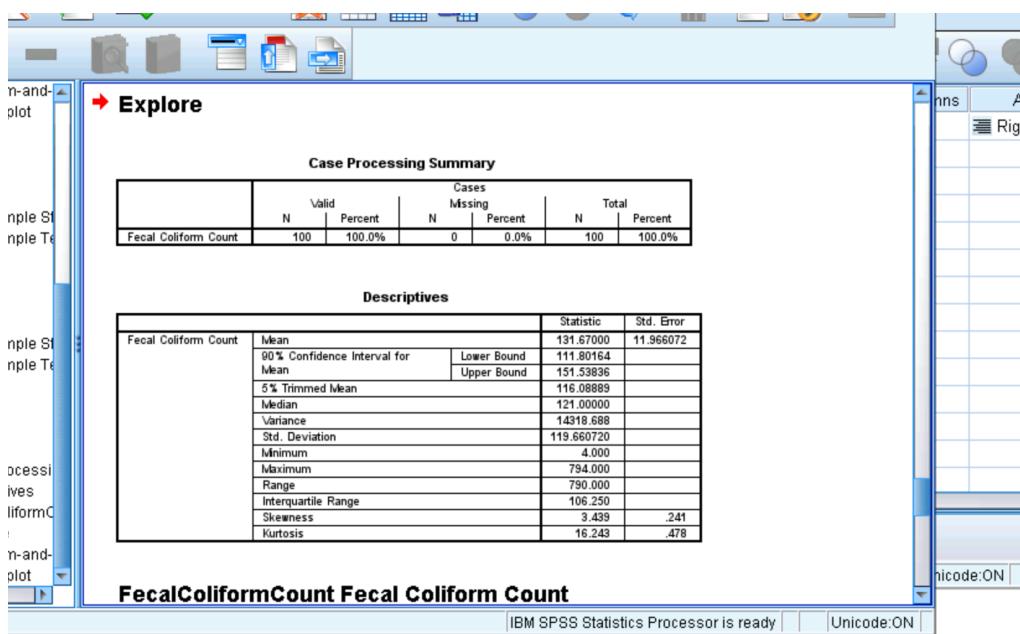
You are to use SPSS to complete a hypothesis test about the mean using an $\alpha=0.05$ level of significance and use the results to develop an opinion regarding the research question. Consider the discussion question below when formulating your opinion. Page two of this document is a template that is intended to help you organize each step of the hypothesis testing process. The data set is in the accompanying Excel file.

Variable View Set-up: Set up variable view. Make sure your data is imported with the appropriate number of decimal places, you add a label for the variable, and the variable type is correct. **Insert a screen shot of your variable view set up below.**

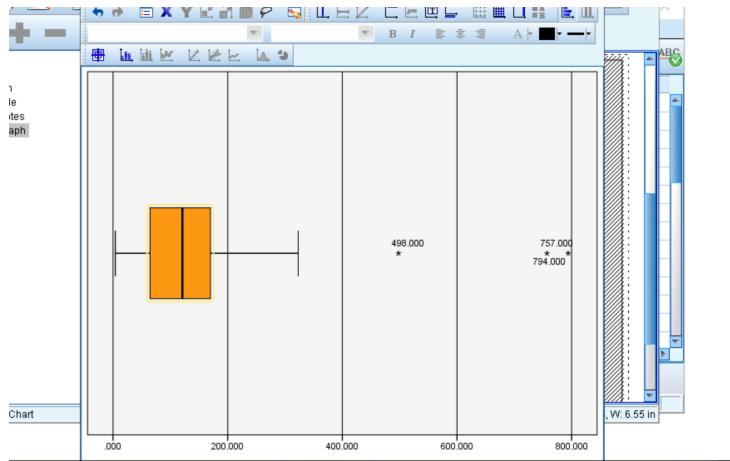


Data Summary: Insert the table from the SPSS output of the summary statistics (mean, median, interquartile range, standard deviation, minimum, maximum, 1st quartile, 3rd quartile, coefficient of skewness and 90% confidence interval) for the variable below. **Analyze > Descriptive Statistics >> Explore** (Statistics – Confidence Interval Percentage = 90%)

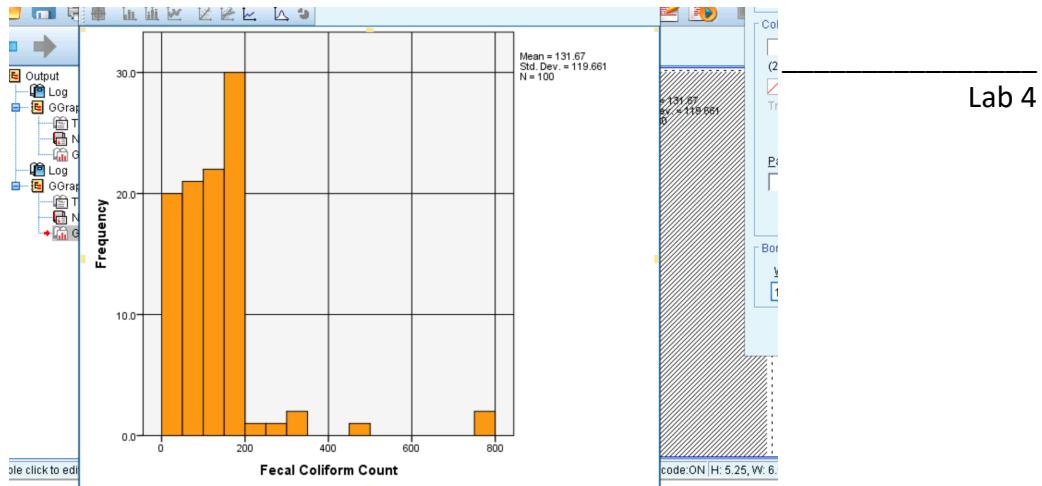
Beach Bacteria



Box and Whisker Plot: Insert the simple box and whisker plots for the variable below. Make sure you change the case numbers to the actual value of the outlier, change the scale, orient the boxplot horizontal, and change the color of the boxplot to the color of the histogram. **Graphs > Chart Builder...**



Histogram: Insert the histograms for the variable below. Change the scale and color of the histogram to match the scale and color of the boxplot. Add gridlines to the histogram. **Graphs > Chart Builder...**



Lab 4

Hypothesis Test: Insert the table from the SPSS output for the one sample t-test on the population mean for the beach bacteria counts. **Analyze > Compare Means > One-Sample T Test...** (Test Value = 200)

```
/VARIABLES=FecalColiformCount
/CRITERIA=CI(.95).
```

► T-Test

One-Sample Statistics			
	N	Mean	Std. Deviation
Fecal Coliform Count	100	131.67000	119.660720

One-Sample Test						
	Test Value = 200			95% Confidence Interval of the Difference		
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Fecal Coliform Count	-5.710	99	.000	-68.330000	-92.07328	-44.58672

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Questions: Use a font color other than red, yellow, or black to answer the following discussion questions.

Descriptive Statistics

- What type if variable are we analyzing? Categorical or Quantitative? **Quantitative**
- What is the value of the sample mean? **131.67**
- What is the value of the sample median? **121.00**
- What is the value of the 3rd quartile? **151.53836**
- Based on the statistical measures in questions 2-4, would the beach be safe for swimming?

Explain.

Since the majority of the samples tested below the maximum allowed amount of fecal coliform, there is enough evidence to conclude that the beach is safe to swim in.

Graphics

Beach Bacteria

6. Is the boxplot left skewed, symmetric, or right skewed? **Left skewed**
7. How many outliers does this data set have? **Three.**
8. Is the histogram unimodal or bimodal? **Unimodal.**
9. Is the distribution approximately Normal? **Explain.**

No, because it is not symmetrical and has outliers.

Hypothesis Test

10. State the null and alternative hypothesis.

$H_0: m \geq 200$

$H_A: m < 200$

11. What is the value of the test statistic? **-5.710**
12. What is the p-value? **0.000**
13. State the decision rule (step 4). If p is less than or equal to alpha we can reject H_0 .
14. What is your decision regarding the null hypothesis? **We can reject the null hypothesis.**
15. Write a conclusion statement for this hypothesis test. **There is sufficient evidence to support that the fecal coliform levels are less than the allowed maximum.**
16. Based on the results of the hypothesis test is the beach safe for swimming? **Explain.**
Yes, because it's below the legal maximum.

Confidence Interval

17. Based on the results of the confidence interval, is the beach safe for swimming? **Explain.**
Yes, because the maximum test value (151.53836) is lower than the legal maximum (200).