

Name _____

Investigation 18: How Stressed Are You?

Worksheet 18.2 Difference Between Proportions

Scenario

The World Happiness Report is a survey of the state of global happiness. The World Happiness Report 2018 ranks 156 countries by their happiness levels. The report named Finland as the top ranked – happiest – country in the world. New Zealand ranked 8th and the United States ranked 18th. All the top countries tend to have high values for all six of the key variables that have been found to support well-being: income, healthy life expectancy, social support, freedom, trust and generosity.

As a student, how happy are you? High school can be very challenging—from the amount of homework, studying for exams, preparing college applications, social anxieties, and athletic competitiveness; students are under a lot of stress. Teens routinely say that their school-year stress levels are far higher than they think is healthy and their average reported stress exceeds that of adults, according to an annual survey published by the American Psychological Association.

Do you feel stressed because of the amount of homework that you have?

The Census at School website contains a large database of responses of questions and responses from students in the United States and other countries.

One question from the Census at School questionnaire that students gave responses to is: "How much pressure do you feel because of the schoolwork you have to do?"

☐ None ☐ Very little ☐ Some ☐ A lot

A random sample from the Census at School database of 100 U.S. 16-17-year-old students who answered the question about stress found that approximately 54% of the students responded some or a lot of pressure.

A random sample from the New Zealand Census at School database of 100 New Zealand 16-17-year-old students who answered the question about stress found that approximately 48% of the students responded some or a lot of pressure.

Formulate a Statistical Question

The results of the two surveys indicate that the two proportions of students who responded that feel some or a lot of pressure are different: 0.54 for U.S. 16-17-year-old students and 0.48 for New Zealand 16-17-year-old students. The difference between the two proportions is 0.06.

Are the two groups of students really not that far apart or is the difference of 0.06 a significant difference? By significant difference, we mean the difference in the response proportions for the two samples is larger than what we would expect to see due to sampling variability.

The statistical question we want to answer is:

“Is there a significant difference between the proportion of U.S. 16-17-year-old students and the proportion of New Zealand 16-17-year-old students who responded that they feel some or a lot of pressure because of schoolwork?”

Collect Appropriate Data

A simulation (similar to the one designed in Investigation 11) will be used to help answer the statistical question. In this simulation, a population is created of 200 students representing the combined number of U.S. and New Zealand students who answered the question.

Create 200 slips of paper of the same size and mark 102 of the slips with an **L** to represent the 102 students who responded they feel Some or A Lot of pressure. Cut out the slips and thoroughly mix the slips in a bag. Then randomly select 100 slips from the bag. These 100 slips represent the number of U.S. teens. Count the number of slips with an **L** and record in the cell labeled U.S. teens and Some or A Lot. Based on this count, complete the table.

	Some or A lot	Little or None	Total
US. teens			100
New Zealand teens			100
Total	102	98	200

Find the proportion of U.S. teens that responded with some or a lot of pressure.

Find the proportion of New Zealand teens that responded with some or a lot of pressure.

Find the difference between these two proportions and record this difference.

Repeat this simulation a large number of times, each time record the difference between the two simulated proportions.

Analyze the Data

Construct a dot plot of the simulated differences between the two proportions.

Interpret the Results

The original surveys showed that 54% of U.S. 16-17-year-old students responded that they felt some or a lot of pressure and 48% of the New Zealand 16-17-year-old students responded that they felt some or a lot of pressure. This gave an observed difference of 0.06.

Based on the simulated differences which were based on assuming there was no difference between the proportions, write a few sentences that address the statistical question:

“Is there a significant difference between the proportion of U.S. 16-17-year-old students and the proportion of New Zealand 16-17-year-old students who responded that they feel some or a lot of pressure because of schoolwork?”