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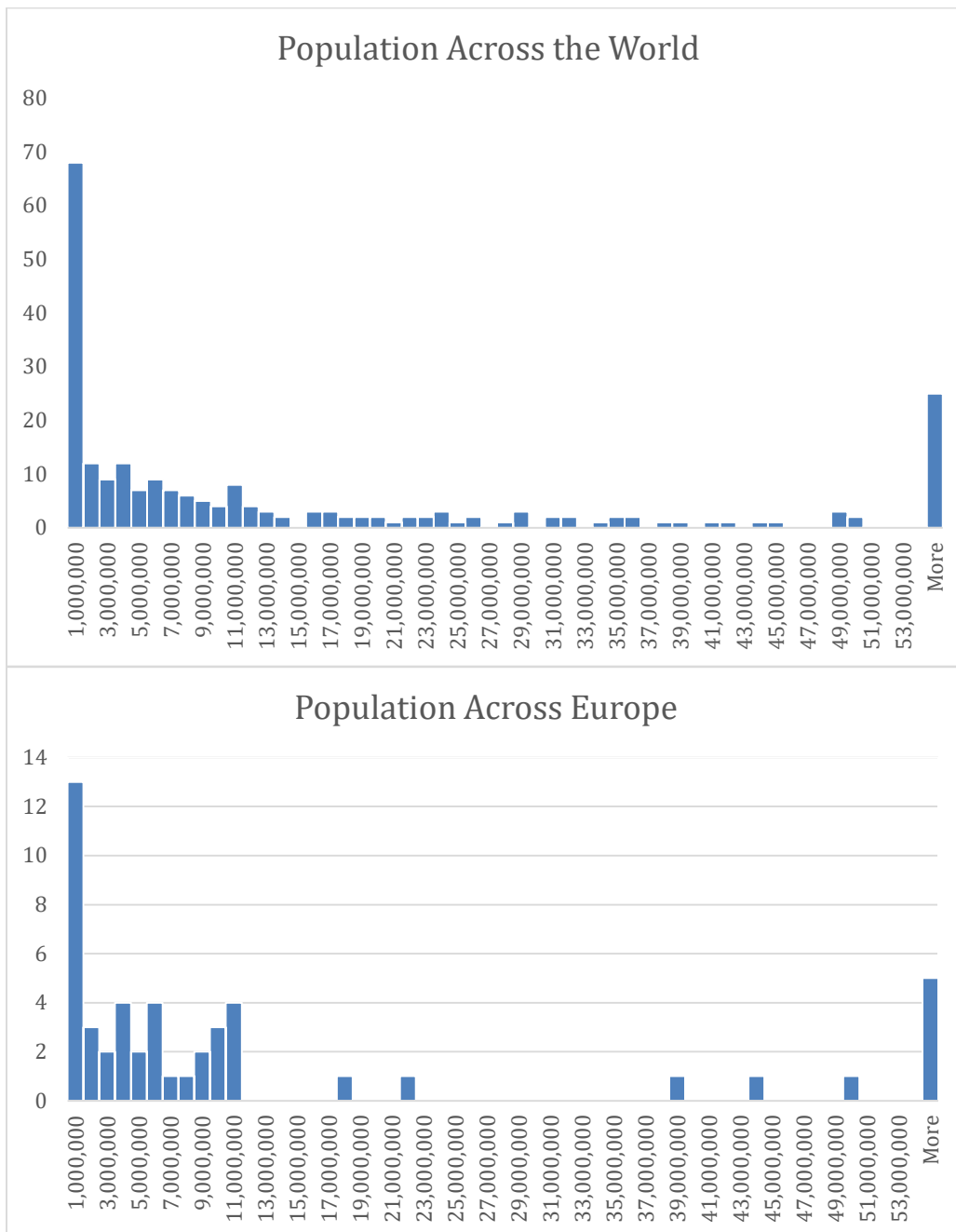
To: Instructors
From: Student(s) Name
Date: Once upon a time
Re: World Population Parameters and Statistics

Introduction

For the years 2017 and 2018, the population was recorded for every country in every region around the world. We studied the population in Europe. We wanted to determine if the difference in the population in Europe from 2017-2018 is different from the entire world population from 2017-2018. We are studying this because a difference in the growth of population in one region of the world compared to the rest could be interesting, suggesting that area may be growing rapidly or slowly for a particular reason, such as war, disease, medicine, crime, etc.

Descriptive Statistics

The mean incidence for the population of all countries in the year 2018 is 32,532,752, and the standard deviation is 130,981,216. Of the 2018 values, the minimum is 5,315, and the maximum is 1,376,745,757. At least 25% of the data is below 575,762, at least 50% of the data is below 5,558,439, and at least 75% of the data is below 21,154,055. The following countries are outliers: Russia, China, United States, Brazil, India, Congo, Mexico, Indonesia, Iran, Ethiopia, Nigeria, Egypt, Tanzania, Pakistan, Turkey, Burma, France, Thailand, Japan, Germany, Vietnam, Philippines, Italy, United Kingdom, Bangladesh. We chose to study Europe more closely. The following histograms show populations for the year 2018.



Inferential Statistics

After subtracting all of the 2017 populations from the 2018 populations, we found the mean of these values to be 332,485 and the standard deviation to be 1,172,026. We also took the mean (7,688) and standard deviation (99,804) from the subtracted values in Europe. Because the mean for Europe's population differences is much lower than the mean of the total population's differences, and the standard deviation being so much higher than the mean, we wanted to find out if the population in Europe is growing differently than the total world population. Even though the graphs appear slightly the same for the year 2018, we need to conduct a test in order to prove with statistical information that Europe's population is growing differently.

The null hypothesis is that $\mu = 332,485$, and our alternative hypothesis is that $\mu \neq 332,485$. We did a two tailed hypothesis test, because the alternative hypothesis suggests that μ could be less than or greater than the original hypothesis. We decided that the sample size (n) is equal to 49, because there are 49 countries in Europe. Because the population is not normally distributed, we used the t-table to decide our rejection zone, which is less than -2.021 or more than 2.021. We did this by using a significance level of .05 and degrees of freedom 48. We then calculated the T test statistic, by using the following equation: $t = (\bar{x} - \mu) / (S / \sqrt{n})$. By using this equation, we found that our T value is -22.78, which is less than -2.021, so we have evidence to reject the null hypothesis. This means that we have evidence that the population in Europe is growing differently than the world population.

Conclusion

Based on our findings, we can conclude that Europe's population, in fact, is growing differently than the rest of the world. Also, because our T value was in our rejection zone, we have statistical proof that the null hypothesis is not true. We also know that there are outliers present in our data based off of our IQR (21,146,446). From our calculations we found that 25 countries are outliers, or that their population from the year of 2018 was either below 20,555,907 people or above 53,456,654 people. We also noticed that the standard deviations for the population differences for the world and for Europe are much higher than the mean, meaning that the data is very spread out, so many of these countries must be growing differently. We do not have an understanding as to why Europe's population is growing drastically differently from that of the rest of the world, but in the future, we could conduct further experiments to find out why.