**Introduction**

 The Greek Life at Longwood University is truly an enriching community. Countless students are rushing and joining fraternities and sororities every year. Longwood recognizes 23 national Greek-letter fraternities and sororities that make up 24% of the campus community. Greek Life membership is the topic of interest because it has been known that the students in these groups obtain and maintain the highest level of academic achievement and uphold the Longwood Honor Code. If 24% of the campus community are made up of Greek Life members, then 20% of the students who took the Statistics Survey are members of Greek Life.

**Data Collection**

 The data that was collected and analyzed throughout this study was categorical data. Categorical variables represent types of data that can be divided into groups. An observational study was chosen to be conducted so that a group or situation could be described, and so the researcher could not manipulate any variables. To avoid biases in this observational study, randomization was utilized. Randomization is the practice of using chance methods to assign subjects to treatments. This avoids bias by roughly distributing the potential effects of lurking variables evenly across the entire sample. This makes sure that the entire population can be representative in the sample size. In this study, the Simple Random Sample (SRS) was created with a TI-84 Plus CE calculator. It was created by selecting the MATH button under the “alpha” key, scrolling to the right three times to arrive at the probability tab labeled “PROB”, and selecting the fifth option that says “randInt(”. Since there were 301 responses to the Statistics Questionnaire given to all MATH 171 and MATH 301 students at the beginning of the semester, the number 1 was entered into the lower bound and the number 301 was entered into the upper bound. A sample size of 30 students was needed for this study so the number 30 was entered in the sample size category labeled “n” for number. After 30 was entered into the calculator, the “enter” key was pressed three times. This generated 30 random numbers that were utilized for choosing which responses of the questionnaire were being selected.

Below is the appendix with the responses of the 30 students in the Simple Random Sample to the questions asking their sex, class, and Greek Life member status.

**Appendix**

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| --- | --- | --- | --- | --- |
|  | Label Number | Sex | Class | Greek House |
| 1 | 265 | Female | Freshman | No |
| 2 | 47 | Male | Junior | Yes |
| 3 | 10 | Female | Junior | No |
| 4 | 89 | Female | Sophomore | No |
| 5 | 200 | Female | Freshman | No |
| 6 | 27 | Female | Sophomore | No |
| 7 | 120 | Female | Freshman | No |
| 8 | 86 | Male | Sophomore | Yes |
| 9 | 266 | Female | Sophomore | Yes |
| 10 | 231 | Male | Sophomore | No |
| 11 | 160 | Female | Freshman | No |
| 12 | 115 | Male | Freshman | No, but planning |
| 13 | 267 | Female | Sophomore | No |
| 14 | 189 | Female | Sophomore | Yes |
| 15 | 137 | Male | Freshman | No |
| 16 | 61 | Female | Sophomore | No |
| 17 | 230 | Male | Senior | Yes |
| 18 | 295 | Male | Sophomore | No |
| 19 | 169 | Female | Freshman | No |
| 20 | 84 | Female | Sophomore | No |
| 21 | 120 | Female | Freshman | No |
| 22 | 62 | Male | Sophomore | No |
| 23 | 211 | Female | Freshman | No, but planning |
| 24 | 282 | Female | Sophomore | No |
| 25 | 239 | Male | Freshman | No |
| 26 | 284 | Female | Sophomore | No, but planning |
| 27 | 45 | Female | Sophomore | No |
| 28 | 121 | Female | Sophomore | No |
| 29 | 194 | Female | Sophomore | No |
| 30 | 202 | Female | Freshman | Yes |

**Data Analysis**

 The above appendix displays the responses of the Simple Random Sample. The hypothesis for this study was that 20% of the students who took this questionnaire would be Greek Life members. In order to determine if the hypothesis is correct, it was important to run a hypothesis test. A hypothesis test was necessary to test this claim because they are used for testing conjectures about unknown parameters. To test this conjecture, the 1-Proportion Z Test was chosen to test the hypothesis. This is an appropriate test because categorical data is being collected/analyzed, and only one proportion of the population is being tested. Before this hypothesis test can be run, the conditions first need to be met. The two conditions that need to be met in order to run the 1-Proportion Z Test are: data must be collected from a Simple Random Sample, and the number of success and failures must both be greater than or equal to ten. For this study, the number of failures (those who were not members of Greek Life) met this requirement with a total of 24 but the number of successes (those who were members of Greek Life), with a total of six, failed to meet the requirement. Since the number of successes did not meet the requirements, the only way to run this hypothesis test was to use the Plus Four Method. This method introduced four new additional trials, increasing both the number of successes and failures by two. This, as a result, increased the number of successes to eight, the number of failures to 26, and the total number of participants to 34 people.

 After performing this technique, the next step was to state the hypotheses. The parameter of interest (p) for these calculations is the proportion of statistics students this semester who are Greek life members. The null hypothesis was set to p = 0.20 and the alternative hypothesis was set to p ≠ 0.20. These hypotheses were appropriate because this study was conducted to determine if 20% of the statistics students who took the survey were Greek Life members. Now that all the conditions have been met and the hypotheses have been stated, the 1-Proportion Z Test was then able to be run. In the TI-84 calculator, the “1-PropZTest” test option was selected. The “po” value was set to 0.20 because this was the null hypothesis being tested. The eight successes were entered as the “X” value and 34 was entered as the sample size. The proportion used for testing was the “≠po” because this was the alternative hypothesis being tested. Once everything was entered into the calculator, the test statistic and P-value were calculated. The test statistic (Z-score) was calculated to be 0.5145 and the P-value was calculated to be 0.6069. The Z-score shows, if the normal distribution is centered around the null hypothesis, that the calculated “p hat” value is 0.5145 standard deviations above the mean. The P-value represents the percent chance of obtaining a result “as extreme” as the one observed. This means that there is a 60.69% chance of obtaining a sample of size 34 that will have the 20% proportion of Greek Life members. The “P hat” value represents the sample proportion and this value was calculated to be 0.2353. This means that the proportion of the people in this sample who are members of Greek Life was 23.53%. Using an alpha level of 0.05 this data is insignificant, and we fail to reject the null hypothesis. We know this because 0.6069 is greater than the 0.05 alpha level. This means that we can determine, based on these data, that there is not enough evidence at the a = 0.05 level to conclude the proportion of Greek Life members at Longwood University does not equal 20%.

**Reasonableness and Limitations**

 To determine if the results from the previous calculations were reasonable, a confidence interval needed to be conducted. A confidence interval represents a range of plausible values where the true population proportion of a variable exists. For this experiment, a 95% confidence level was chosen to calculate the interval. The range of plausible values for the true population proportion was calculated to be (0.0927, 0.3779). This means that we are 95% confident that between 9.27% and 37.79% of the students who took the statistics questionnaire this semester are members of Greek Life. Since the 20% value being tested by the 1-Proportion Z Test is within this range, the results are thus proven reasonable.

Unfortunately, this observational study encountered response bias because only students who enrolled in Statistics 171 and 301 this semester were the students who took the questionnaire. This is response bias because the entirety of Longwood University did not take the survey. It was more convenient for the Statistic students to take the questionnaire since they are the ones who must complete the assignment. Although response bias was encountered in this study, I am very confident in this work because randomization was utilized. This avoids bias by roughly distributing the potential effects of lurking variables evenly across the entire sample. This makes sure that the entire population can be representative in the sample size.

**Conclusion**

The results from this observational study prove that the hypothesis statement was correct. 20% of the people who responded to the statistics questionnaire were members of the Greek Life of Longwood University. Using inferential statistics, we were able to calculate an inference regarding the true population proportion of Longwood University statistics students who are members of Greek Life. After the Plus Four Method was performed to increase the number of successes and failures, the “p hat” value was found to be 0.2353. This means that the proportion of students, in this sample, who are members of Greek Life is 23.53%. The P value for this study was found to be 0.6069. Because this value is greater than the 0.05 alpha level, this data is not rare enough to be significant. This means there is not enough evidence at the a = 0.05 level to conclude the proportion of Greek Life members does not equal 20%. The Z score for these calculations was found to be 0.5145. This represents how many standard deviations away from the mean the calculated results would if the null hypothesis is true. This value tells us that the calculated results are only half a standard deviation away from the true proportion value, which also indicates this is reliable data.