# MAT 243 Project Two Summary Report

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I am a data analyst for the Miami Heat. The purpose of this report is to analyze performance patterns between my team’s games from the years 2013 to 2015 and the Chicago Bulls’ games from 1996 to 1998. I am using the FiveThirtyEight NBA Elo dataset provided by Kaggle. I employ descriptive statistics, specifically one of the measures of center: the mean. Other methods in this report are hypothesis tests for population mean, proportion, and the difference between two population means. My team is the Miami heat during the years 2013 to 2015. My assigned team for comparative study was the Chicago Bulls from the years 1996 – 1998.

Table 1. Information on the Teams

|  | **Name of Team** | **Years Picked** |
| --- | --- | --- |
| 1. Yours | Heat | 2013 - 2015 |
| 2. Assigned | Bulls | 1996 - 1998 |

Hypothesis testing is used to test a statistical claim about a population mean. An informed assumption, or null hypothesis, is presented against known statistics in an attempt to predict the relative performance of a population mean. In our case, the null hypothesis was that the Miami Heat had an average relative skill greater than 1420, mathematically represented by: . The alternative hypothesis would be that the average relative skill is greater than or equal to 1420, represented by: . Our null hypothesis had a 5% level of significance, The table below shows the results of the t-test.

Table 2: Hypothesis Test for the Population Mean (I)

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | 30.99 |
| P-value | 9.5897e-87 (zero) |

The p-value is not technically equal to zero but a very small number. The p-value is less than the level of significance and therefore we cannot reject the null hypothesis. The implications and practical significance of these results are that the managers were right in their statement that of our team in the years 2013-2015 is greater than 1420. One of the lowest skill levels in the league was 1420 and our team did better than that. This is not very practically significant because it is a broad statement.

Our coach hypothesized that our team, the Heat, scored at an average of less than 110 points in the years 2013-2015. This is mathematically represented by: . The alternative hypothesis would be that the average number of points scored by our team was greater than or equal to 110 from 2013 to 2015, represented by: . Our null hypothesis had a 1% level of significance, The table below shows the results of the t-test.

Table 3: Hypothesis Test for the Population Mean (II)

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | 236.59 |
| P-value | 3.3041e-291 (zero) |

The p-value suggests that the null hypothesis is true, since it is less than the level of significance. The implications are that the Heat did not do very well based on the observation that a team averaging 110 points was likely to do very well during the regular season.

Hypothesis testing for a population proportion is used to determine if a population proportion is the same as a hypothesized proportion. This can be used to test theories about the proportion of a population that are associated with an arbitrary statistic. In our case, we are validating the proportion of games that the Heat scored 80 or more points. Management claims that the proportion of games that the Miami Heat wins when scoring 80 or more points is 0.50 at a significance level of 5% (). The null hypothesis can be represented by the notation and conversely the null hypothesis can be represented by .

Table 4: Hypothesis Test for the Population Proportion

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | -2575.25 |
| P-value | 0.00 |

The table above shows the p-value of zero that was ascertained through the z-test. Because the p-value is less than the significance level, we can reject the null hypothesis. Step 5 analysis showed that the Proportion of games won by the Heat when scoring more than 80 points in the years 2013 to 2015 was 0.66 (rounded). This means more games were won scoring more than 80 points than management claims. The practical significance of this statistic is that the threshold of points it takes to increase the odds of cementing a win is less than previously thought.

Hypothesis testing for differences between two population means is used to hypothesize about the average performance of both populations against one another. This is a measure of performance in our case, because we tested the claim that the skill level of the Miami Heat was the same as the skill level of the Chicago Bulls, using a 1% level of significance. This is the null hypothesis and can be mathematically expressed by . The null hypothesis would be that the skill level of the teams are not the same, or .

Table 5: Hypothesis Test for the Difference Between Two Population Means

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | 17.07 |
| P-value | 0.00 |

Based on the p-value above, we reject the null hypothesis. The skill level of the Heat and Bulls are not the same. Raw mean calculations reveal the disparity between the two teams’ skill levels. The Bull have a mean relative skill of 1739 whereas the Heat is 1617. The practical significance of these findings is that we could take note of the successful methods the Bulls have adopted in order to gain skill. We could reach out to them or study their technique to derive their training practices as well as their strategy.

The practical importance of the analyses that were performed is that we proved that our team is not the best in the league; therefore, we should adapt and grow as a team in order to reach a higher plane of success. These results showed that the Chicago Bulls are a very skillful and successful team. By comparison, the Miami Heat have a lot to learn. The managers will most likely be stunned by these statistics, as this is the first report I have done of this nature. The next step toward reaching a higher skill level will be to adopt techniques used by the Bulls and eliminate any weak links in our strategy as a team.