# MAT 243 Project Two Summary Report

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In this project, we are going to analyze historical data of NBA basketball teams to identify patterns and trends. We will use this information to compare it to the Golden State Warriors' performance between 2013 and 2015. This will allow us to identify the team’s flaws and help improve the team in upcoming seasons. The data consists of a large set of historical records related to NBA basketball teams from multiple seasons. Additionally, we will use several hypothesis tests to analyze the data and validate claims about the team’s performance. These tests include the hypothesis test for the mean, the hypothesis test for proportion, and the hypothesis test for the difference between two population means.

For this report, our team is the Golden State Warriors during the years 2013 to 2015. On the other hand, the team we are comparing the Golden State Warriors to is the Chicago Bulls during the years 1996 to 1998. Below there is a table that contains the team’s information

Table 1. Information on the Teams

|  | **Name of Team** | **Years Picked** |
| --- | --- | --- |
| 1. Yours | Golden State Warriors (Warriors) | 2013-2015 |
| 2. Assigned | Chicago Bulls (Bulls) | 1996-1998 |

In general, hypothesis testing lets us check ideas about a population's mean. We do this by setting a starting assumption, also known as the null hypothesis () about the average, and then comparing it to a special value (p-value or ***p***). This comparison helps us decide if we should reject the initial assumption. We do this to figure out if there's enough evidence to support our claim about the population.

Summarizing all the important steps of the hypothesis test, we first set the null hypothesis (). As it was mentioned before, this is the statement we assume to be true unless we find out that it is not after analyzing the final result of our hypothesis test. In this case, the management of the Warriors hypothesized that the team’s average skill level is greater than 1340. Our null hypothesis is that the Warrior’s skill level is 1340, and it can be represented as . On the other hand, the alternative hypothesis () is the statement that contradicts the null hypothesis. This means that the management team hypothesis of the Warriors having a skill level greater than 1340 is our alternative hypothesis. This hypothesis can be statistically represented as . We will be testing this hypothesis using a **5% (0.05)** level of significance **(*α*)**, and we will use it to compare it to our p-value (probability value or ***p***), allowing us to identify if the null hypothesis should be rejected.

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

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | 46.95 |
| P-value | 0.0 |

Based on the data, the p-value is less than the level of significance. This is represented as or using the numbers as . Therefore, we can reject the null hypothesis due to sufficient evidence. This suggests that the alternative hypothesis is correct, indicating the Golden State Warriors' average skill level is greater than 1340 (). Their actual skill level was calculated at 1607.22. We can infer that the team is on the right path to becoming a top NBA team and should continue to improve.

In addition, the Warriors’ coach made another hypothesis saying that the average number of points scored by the team from 2013 to 2015 was less than 106 points. Using that information, we performed another hypothesis test. The null hypothesis () in this case, will be that the points scored by the Warriors are equal to 106 points (). On the other hand, the alternative hypothesis () is that the points scored by the Warriors are less than 106 points . We tested the claim using a 1% level of significance (***α***) and used it to compare our result and see if the coach’s hypothesis is correct.

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

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | -1.18 |
| P-value | 0.24 |

After looking at our results, we found out that the p-value () is greater than the significance level (***α***) or (**0.24 > 0.01**). This suggests that there isn’t strong evidence to reject the null hypothesis. We can also visualize this by calculating the mean points scored by the Warriors between 2013 and 2015 and comparing it to the 106 points the coach hypothesized. We calculated that the points scored by the team was 105.13 points. We can conclude that the difference between the points scored by the Warriors and the points hypothesized by the coach is not statistically significant. We can also say that since the Warriors scored an average of 105.13 points in the years 2013 to 2015, the claim the coach made about the team scoring less than 106 points is not statistically correct.

The management of the Warriors also claims that the proportion of games that the Warriors win when scoring 102 or more points is 0.90 or 90%. We proceeded to test this claim using a 5% level of significance (***α***).

In general, hypothesis testing is used to test claims about a population proportion by stating what proportion we think exists (). This I also known as the null hypothesis (), and in this case, the null hypothesis will be the proportion of games the Warriors win when scoring 102 or more points is 0.90 (90%), or statistically represented as . Conversely, we also state the alternative hypothesis (), which in this case is that the proportion of games the Warriors win when scoring 102 or more points is not equal to 0.90 (90%) or . Furthermore, we used a level of significance (***α***) of 5% (0.05) to compare it to our p-value () and identify if the claim made by management is statistically correct. See the table below.

Table 4: Hypothesis Test for the Population Proportion

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | -2.78 |
| P-value | 0.0055 |

If we compare the level of significance (0.05) and the p-value (0.0055), we see that the p-value is less than the level of significance (). This means that we can reject the null hypothesis. Hence, we can conclude that the proportion of games the Warriors win when scoring 102 or more points is not equal to 90% or . In fact, we calculated the actual proportion of games they won, and it is 82.98% or 0.8298. The claim that the management team made is not true, and we need to collect more data to determine the number of points needed for the Warriors to always win.

Finally, we were asked to compare the Golden State Warriors' skill level from 2013 to 2015 with the Chicago Bulls' skill level from 1996 to 1998. We tested the claim that the skill level of the Warriors is the same as the Bulls, using a 1% level of significance (***α***).

In general, hypothesis testing is used to test claims about the difference between two population means. To do so, we set the null hypothesis () to be that there is no difference between both teams' skill levels or . Then, we set the alternative hypothesis () to be that the skill levels are different or . We need to use a level of significance (***α***) to determine how likely it is that we would observe such a difference by chance. In this case, we chose a level of significance (***α***) of 1% (0.01), and it will be used to compare it to our p-value ().

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

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | 20.18 |
| P-value | 0.0 |

Based on our analysis, we can reject the null hypothesis because the p-value is less than the chosen level of significance (). This suggests that the alternative hypothesis () is correct () because there is a statistically significant difference between the teams' skill levels. While the Bulls' specific skill level is 1739.8, the Warriors’ skill level is 1607.22, meaning that there is a big difference between their skill levels. To achieve a similar level of performance, the Warriors' management team may need to consider improvements like scoring more points or strengthening their defense.

This analysis provides valuable insights for the Golden State Warriors management team to improve the team's performance in upcoming seasons by comparing it to one of the best NBA teams of all time, which is the Chicago Bulls of the years 1996 to 1998. This report confirmed that even though the Warriors have a high skill level, there is still a gap between their skill level and the Bulls’ skill level. Also, while the coach's hypothesis of needing to score over 106 points wasn't statistically significant (Warriors averaged 105.13), it suggests a focus on offensive strategies could be beneficial. Additionally, the management's claim that scoring 102+ points guarantees a 90% win rate was disproven (the actual win rate is 82.98%). This emphasizes the need for a more nuanced understanding of winning factors beyond just points.

For this scenario, the Warriors have a strong foundation, but there is room for improvement to reach the level of elite teams like the 1996 – 1998 Bulls. The scoring analysis suggests the team needs to explore other offensive strategies. Finally, the management's win rate claim highlights the importance of analyzing game data beyond just points scored to identify key winning factors. To sum up, these analyses provide a data-driven approach for the Warriors' management team. By focusing on identified weaknesses and implementing targeted improvements, the Warriors can bridge the gap to elite teams and achieve sustained success.