

## **MAT 243 Project Two Summary Report**

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The Purpose of this summary is to analyze two different NBA teams from two different time periods and see how their skills compare. The data set we used were historical game records which include the number of points scored and also the Elo rating, which tells us their team skill level. We are trying to prove how over time these factors have impacted such as average skill levels, average points scored, winning proportions, and differences between teams' performances. To figure it out I will use various hypothesis tests with test such as population means, population proportions, and comparisons between two population means.

Below is a chart showing my team and the team assigned to me and the years we are analyzing:

|             | <b>Name of Team</b> | <b>Years Picked</b> |
|-------------|---------------------|---------------------|
| 1. Yours    | Warriors            | 2013-2015           |
| 2. Assigned | Bulls               | 1996-1998           |

For the first hypothesis testing, we will evaluate whether the skill level of the Warriors is greater than the skill threshold of 1340. I will be using a significance level of 5% Our null hypothesis states that the skill level is equal to 1340 ( $\mu = 1340$ ) and our alternative hypothesis states that our skill is greater than 1340 ( $\mu > 1340$ ). Since I don't know the populations standard deviation, we used a one0sample t-test.

| <b>Statistic</b> | <b>Value</b> |
|------------------|--------------|
| Test Statistic   | 46.95        |
| P-value          | 0.00         |

The p-value is 0 which leads me to reject the null hypothesis. The results say that there is strong data that shows that the Warrior's average skill level was higher than the threshold meaning high skill level. Farther in the study, my team's coach hypothesized that the average number of points scored by my team is less than 106 points so for this test we tested a one-sample t-test at

1% significance level. The null hypothesis states that mean points scored is equal to 106 ( $\mu > 106$ ) and our alternative hypothesis says the teams mean points scored is less than 1036 ( $\mu < 106$ ).

| Statistic      | Value |
|----------------|-------|
| Test Statistic | -1.18 |
| P-value        | 0.12  |

Looking at the data, we can see that the p-value is greater than the significance level, so the null hypothesis is not rejected. There isn't enough data to say the warriors scored less than 106 points on average.

Next, management claimed that my team won 90% of their games when they scored 102 or more points. So, to test their hypothesis, we used a z-test for proportions at 5% significance level. Our null hypothesis states that the win proportion in these games is 0.90 ( $p = 0.90$ ) and our alternative hypothesis states the proportions is different ( $p \neq 0.90$ ).

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

The p-value is less than 0.05 which leads us to reject the null hypothesis which we can see that there is strong data to show that my team's proportions for scoring is actually lower than what the management claimed.

For my last hypothesis test, I made a comparison between how skilled the Warriors and the Bulls are using independent two-sample t-test at a 1% significance level. My null hypothesis states that they are equal to the bulls ( $\mu_{\text{Warriors}} = \mu_{\text{Bulls}}$ ), my alternative hypothesis on the hand states that they are in fact not the same ( $\mu_{\text{Warriors}} \neq \mu_{\text{Warriors}}$ ).

| <b>Statistic</b> | <b>Value</b> |
|------------------|--------------|
| Test Statistic   | 20.18        |
| P-value          | 0.0000       |

Looking at the data, we can see that the p-value is so low, this means the null hypothesis can be rejected. There is enough strong data to see that the average skill of the two teams is very different with the bulls having higher skill rating, meaning Bulls in 1996 to 1998 were doing a lot better in terms of skills compared to the Warriors during 2013 to 2015.

This whole analysis confirmed the difference in skill levels and performance metrics between the Warriors and the Bulls. We did many tests such as how the Warriors did not score below 106 points on average. We also saw how their winning proportions when scoring over 102 points were a lot lower than what the management predicted at 90%. Last but not the least, the Bulls surprisingly showed better overall relatively skill compared to the Warriors. This report is very beneficial to the management team for insights and to find areas of strength and where to improve.