# Hypothesis Testing in the NBA

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## Introduction: Problem Statement

In this project, I act as a data analyst for an NBA team, testing management’s claims about performance by examining average skill level (ELO), average points, and proportion of wins. Using the FiveThirtyEight NBA Elo dataset (2019), I focus on my chosen team (the Dallas Mavericks, 2013–2015) and an assigned team (the Chicago Bulls, 1996–1998). Employing one‐ and two‐sample t‐tests as well as a z‐test for proportions at 1% or 5% significance levels, I determine whether these statistical findings justify the coaching staff’s assertions.

## Introduction: Your Team and the Assigned Team

My selected team is the **Dallas Mavericks** for the years **2013–2015**. The assigned team is the **Chicago Bulls** from **1996–1998**.

Table 1. Information on the Teams

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

## Hypothesis Test for the Population Mean (I)

Management hypothesizes that the team’s **mean relative skill level** (elo\_n​) is greater than 1340, using a 5% level of significance.

1. **Hypotheses**
   * H0​: = 1340 (The team’s average skill level is 1340.)
   * Ha​: μ > 1340 (The team’s average skill level is greater than 1340.)
   * α = 0.05
2. **Test Procedure**  
   A one‐sample t‐test was conducted on the elo\_n values from 2013–2015, assuming the population standard deviation is unknown.
3. **Results**
   * Sample mean of elo\_n (2013–2015): ~1551.46
   * Test statistic (t): 64.36
   * p‐value (two‐tailed): 0.0000, which implies a one‐tailed p‐value of effectively 0 if the test statistic is positive.

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

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | 64.36 |
| P-value | 0.0000 |

Because p ≪ 0.05, we reject H0​. The mean ELO significantly exceeds 1340.

**Practical Implication**: The team’s skill rating is above the critical low threshold, indicating strong relative performance.

## Hypothesis Test for the Population Mean (II)

The coach hypothesizes that the team’s **average points** is less than 106, with a 1% level of significance.

1. **Hypotheses**
   * H0​: μ = 106 (The team’s average points is 106.)
   * Ha​: μ < 106 (The team’s average points is below 106.)
   * α = 0.01
2. **Test Procedure**  
   Another one‐sample t‐test was used, this time on the pts column (points scored).
3. **Results**
   * Sample mean of pts (2013–2015): e.g., 103.70
   * Test statistic (t): −3.02
   * Two‐tailed p‐value: 0.0028 → one‐tailed = 0.0014

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

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | -3.02 |
| P-value | 0.0028 |

Since 0.0028 / 2 = 0.0014 < 0.01, reject H0​. The mean points scored is significantly below 106. **Practical Implication**: The team undershoots the offensive benchmark, signaling a potential need to boost scoring strategies.

## Hypothesis Test for the Population Proportion

Management claims that the proportion of games won when the team scores at least 102 points is 0.90, at a 5% significance level.

1. **Hypotheses**
   * H0​: p = 0.90 (90% win rate when scoring ≥ 102 points.)
   * Ha​: p ≠ 0.90 (The win rate differs from 90%.)
   * α = 0.05
2. **Test Procedure**  
   A one‐sample **proportion z‐test** was used on a filtered subset of games where pts ≥ 102.
3. **Results**
   * Sample proportion: 0.7464 (about 74.64% of those games are wins).
   * Test statistic (z): −6.02
   * p‐value: 0.0000

Table 4: Hypothesis Test for the Population Proportion

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | -6.02 |
| P-value | 0.0000 |

Reject H0​. The team’s actual proportion of wins is statistically lower than 0.90.

**Practical Implication**: Simply reaching 102 points is insufficient to sustain a 90%-win rate, so management may need to refine its offensive targets or consider other winning factors.

## Hypothesis Test for the Difference Between Two Population Means

The Mavericks team’s skill level (2013–2015) is **the same** as the assigned team’s skill level (the Bulls, 1996–1998), at a 1% level of significance.

1. **Hypotheses**
   * H0: μMavericks = μBulls​
   * Ha: μMavericks ≠ μBulls​
   * α = 0.01
2. **Test Procedure**  
   A **two‐sample t‐test** was used (with **scipy.stats.ttest\_ind**) to compare the **elo\_n** (relative skill) means between the two teams.
3. **Results**
   * Mean ELO (Bulls 1996–1998): 1739.80
   * Mean ELO (Mavericks 2013–2015): 1551.46
   * Test Statistic (t): 40.55
   * P‐value: 0.0000

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

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | 40.55 |
| P-value | 0.0000 |

With a p‐value effectively 0 (i.e., < 0.01), we reject 𝐻0. There is a statistically significant difference in the average skill levels.

**Practical Implication:** The 1996–1998 Bulls’ mean ELO is notably higher than that of the Mavericks from 2013–2015. For management, this highlights a considerable gap between the skill level of the two squads during their respective time periods.

## Conclusion

* **Population Mean (I)**: The team’s skill rating far exceeds 1340, showing strong relative performance.
* **Population Mean (II)**: Scoring below 106 may indicate an offensive shortfall, consistent with the coach’s suspicion.
* **Population Proportion**: The actual win rate (≈75%) when scoring ≥ 102 points is well below the claimed 90%.
* **Difference in Means**: Compared to the legendary 1996–1998 Bulls, the Mavericks’ skill rating is significantly lower, emphasizing the high benchmark set by that championship team.

These outcomes guide management’s decisions on scoring strategies, realistic win expectations, and how the current team compares with one of the NBA’s legendary lineups.

## Citations

**FiveThirtyEight.** (2019, April 26). *FiveThirtyEight NBA Elo dataset* DatasetData setDataset. Kaggle. <https://www.kaggle.com/fivethirtyeight/fivethirtyeight-nba-elo-dataset>