Project Title: Analyzing the Impact of Defensive Alignments on Performance in the 2022-2023 NBA Season
Date: May 2023

Objective

This project evaluated how different defensive strategies employed by NBA teams during the 2022-2023 season influenced opponent scoring efficiency (measured by PPP and eFG%) and overall team success. The goal was to identify optimal defensive schemes for limiting opponent productivity.

Data Sets

1. **NBA Stats API**
   - Source: Official NBA tracking data (publicly available via NBA.com/stats).
   - Variables: Play-by-play data, defensive alignment classifications (man-to-man, zone, hybrid), opponent PPP, eFG%, and possession counts.
2. **Basketball Reference**
   - Source: Basketball-Reference.com.
   - Variables: Team defensive ratings, opponent shooting splits, and game tempo (pace).
3. **Second Spectrum Tracking Data**
   - Source: Proprietary NBA player-tracking data (accessed via partnership with the league).
   - Variables: Defensive scheme frequency (e.g., switching, drop coverage, blitzing), spatial positioning, and opponent shot difficulty.
4. **Cleaning the Glass**
   - Source: CleaningTheGlass.com.
   - Variables: Context-filtered defensive metrics (e.g., "no garbage time" opponent PPP).

Methodology

- **Data Integration:** Merged tracking data (Second Spectrum) with traditional metrics (NBA Stats API) to classify defensive schemes (e.g., "hybrid" = 60% man-to-man, 40% zone).

- **Statistical Modeling:** Ran multivariate regression in **R** using `lm()` and `glm()` to quantify the impact of defensive alignments on PPP and eFG%, isolating scheme-specific effects.
- **Sensitivity Analysis:** Tested robustness by adjusting for outliers (e.g., games with extreme pace) and rerunning models with interaction terms (e.g., scheme × opponent three-point rate).

Key Findings

1. **Hybrid Defenses** reduced opponent PPP by **0.12 points per possession** ($p < 0.05$) compared to static schemes.
2. Teams using **adaptive switching** (e.g., switching 4–6 times per possession) held opponents to **3.2% lower eFG%** in isolation plays.
3. **Defensive complexity** (e.g., mixing zone and switching) showed diminishing returns: teams altering schemes >12 times per game saw *increased* opponent PPP due to miscommunications.

Impact

The study demonstrated that **scheme versatility**—not rigidity—correlates with elite defense. Teams like the Memphis Grizzlies (top-5 defense in 2023) exemplified this by blending drop coverage with timely zone shifts, reducing opponent PPP by 8% in clutch scenarios.

Tools & Skills

- **R** for analysis (`tidyverse`, `broom`), visualization (`ggplot2`), and regression diagnostics.
- **SQL** to query large tracking datasets.
- Interpretation of advanced metrics (e.g., quantifying "defensive adaptability" using scheme frequency and entropy measures).

Conclusion

By linking defensive strategies to quantifiable outcomes, this project highlighted the importance of **tailored game planning**. Hybrid schemes and moderate adaptability

emerged as key drivers of defensive success, offering actionable insights for coaches optimizing rotations and in-game adjustments.