

Quarterback Impact on NFL Team Success*

An Analysis of the 2023 Regular Season

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Quarterbacks (QBs) are often regarded as central to the success of NFL teams, yet the extent of their influence remains a topic of discussion. This study examines the relationship between quarterback performance metrics—such as passing yards, touchdowns, and interceptions—and team-level outcomes, including total wins, playoff qualification, and average point differential. Using Bayesian regression models, these relationships are quantified, highlighting the interplay between individual performance and broader team dynamics. The findings suggest that while QBs play a significant role, their impact is part of a larger system that also relies on team cohesion, defensive capabilities, and coaching strategies. This analysis adds to the understanding of what contributes to building balanced NFL teams and offers practical considerations for sports analysts, coaches, and strategists.

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*Code and data are available at: [https://github.com/vandanppatel/impact_qb_nfl].

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1 Introduction

The National Football League (NFL) is often regarded as a quarterback-driven league, with players such as Patrick Mahomes, Joe Burrow, and Jalen Hurts frequently viewed as central to their team's success. Their performances are regularly highlighted as critical to outcomes ranging from regular-season wins to playoff appearances and Super Bowl victories. This focus raises an important question: how much do quarterbacks influence team success, and can their performance metrics reliably predict outcomes such as total wins, playoff qualification, or average point differential?

This study examines the relationship between quarterback-specific metrics and team-level success. Using data from the 2023 NFL regular season, Bayesian regression models are employed to analyze how variables such as passing yards, touchdowns, and interceptions contribute to outcomes like total wins and playoff qualification. These metrics offer a structured way to evaluate the role of quarterbacks in a highly interconnected team sport.

1.1 Estimand

This research quantifies the influence of quarterbacks on team performance. Specifically, it estimates the relationships between quarterback metrics and key team outcomes:

- **Wins:** The total number of games won during the regular season.
- **Playoff Qualification:** Whether a team advanced to the postseason, modeled as a binary outcome.
- **Average Point Differential:** A continuous measure capturing a team's overall dominance or struggles during the season.

The hypothesis aligns with the belief that quarterbacks play a significant role in team success, while also recognizing that football is a team sport with many interdependent factors. This dual perspective forms the basis of the analysis, situating quarterback performance within the broader context of team dynamics.

1.2 Results

The findings reveal notable patterns in the relationships between quarterback performance and team success. Metrics such as passing touchdowns and interceptions demonstrate statistically significant associations with outcomes like total wins and playoff qualification, though the effects are moderate. For instance, interceptions negatively impact team success by creating

turnovers and momentum shifts. Similarly, touchdowns positively contribute to wins but cannot solely account for a team’s performance.

These results highlight the importance of complementary factors, such as defensive performance and offensive line strength. Even elite quarterbacks like Mahomes can face challenges if consistently pressured by opposing defenses. This broader perspective challenges the narrative of quarterbacks as singular game-changers, emphasizing the interconnected nature of football success.

1.3 Why It Matters

Understanding the role of quarterbacks in team success has practical implications for NFL strategy and management. While teams often invest heavily in quarterbacks, these findings suggest that focusing on other aspects, such as defensive cohesion and offensive line protection, may offer more balanced and effective strategies. For example, the San Francisco 49ers’ recent achievements underscore the value of a well-rounded roster that complements quarterback performance with strong team dynamics.

This research also contributes to ongoing discussions about the validity of attributing wins solely to quarterbacks. By providing empirical evidence, the study helps ground these debates in data, offering a clearer understanding of the interplay between individual and team performance.

The remainder of this paper is structured as follows. Section 2 provides an overview of the datasets used, including key variables and their measurement. Section 3 describes the Bayesian framework applied to analyze the data, with mathematical formulations and justifications. Section 4 presents the analysis findings, highlighting the relationships between quarterback metrics and team success. Section 5 interprets these findings, considers limitations, and outlines directions for future research. Finally, Section 6 summarizes the study’s key takeaways and their implications for NFL teams and analysts.

2 Data

2.1 Overview

We use the statistical programming language R (R Core Team 2023) to analyze data collected from the NFL’s 2023 regular season. This analysis relies on two key datasets: (1) quarterback statistics and (2) team-level statistics. The data was acquired from publicly available NFL play-by-play data and further processed to provide detailed insights into quarterback performance and team success.

The quarterback dataset contains aggregated statistics for starting quarterbacks across all teams in the 2023 NFL regular season, including passing yards, touchdowns, and interceptions.

The team dataset provides team-level metrics such as total wins, average score differentials, and playoff status.

Our analysis follows principles outlined in (Alexander 2023), focusing on clear and interpretable results. Data cleaning and aggregation were performed using the `tidyverse` (Wickham et al. 2019) and `nffastR` (Carl and Sharpe 2023) packages, ensuring consistency and reproducibility. The `arrow` package (Contributors 2024) was used to save and access cleaned data in an efficient, platform-agnostic format, enhancing compatibility and speed during analysis. The `janitor` package (Firke 2024) was used to clean and standardize column names, improving code readability and ensuring compatibility across functions. File paths were managed using the `here` package (Müller 2024), ensuring the reproducibility of the project across different environments. Visualizations were created using `ggplot2` (Wickham et al. 2024), which provides an intuitive and flexible framework for plotting relationships between variables.

2.2 Measurement

The datasets used in this analysis provide detailed measurements of quarterback and team performance. Each measurement reflects both raw play-by-play data and advanced metrics from the NFL. The transformation of these raw inputs into usable variables is guided by methodologies in the field of sports analytics (Gebru et al. 2021).

2.2.1 Quarterback Statistics

The quarterback data is derived from play-by-play events recorded during each game. Passing yards, touchdowns, and interceptions are tracked for each play involving a passing attempt. To calculate season-level statistics, these metrics are aggregated for starting quarterbacks, defined as those who played the most games for their respective teams.

- **Passing Yards:** Total yards gained by a quarterback through completed passes.
- **Passing Touchdowns:** Total number of passes thrown by a quarterback that resulted in touchdowns.
- **Interceptions:** Total number of passes intercepted by the opposing team.
- **Average Per-Game Metrics:** Passing yards, touchdowns, and interceptions are normalized by the number of games played to allow fair comparisons across quarterbacks with differing season lengths.

2.2.2 Team Statistics

The team-level data is aggregated to reflect overall team performance throughout the season. Key metrics include:

- **Total Wins:** Number of games a team won during the 2023 regular season, calculated using final game scores to compare home and away teams' points.
- **Average Score Differential:** The difference between a team's average points scored and points allowed per game.
- **Playoff Status:** Binary indicator of whether a team qualified for the postseason, based on publicly available postseason qualification data.

The measurements are further enriched by incorporating insights from the NFL Next Gen Stats platform, which uses RFID tracking technology embedded in players' equipment to generate advanced metrics such as route speeds, quarterback release times, and passing efficiencies (National Football League 2024). These metrics provide a robust understanding of individual quarterback performance and team success, enabling standardized comparisons across teams and players.

2.2.3 Metric Calculations

Metrics were calculated as follows:

- **Passing Yards, Touchdowns, and Interceptions:** Summed for each starting quarterback across all games.
- **Wins:** Counted based on game outcomes, excluding ties.
- **Score Differential:** Calculated as the difference between points scored and points allowed, averaged per game.

The cleaned data ensures consistency and focuses on variables relevant to the analysis.

2.3 Outcome Variables

The primary outcome variables for this study are team wins and playoff qualification, which serve as proxies for team success. Each outcome is examined in conjunction with quarterback performance metrics to explore their relationships.

2.3.1 Team Wins

This variable is used to quantify success at the team level. Teams with higher win totals are presumed to have performed better during the season. A bar plot is provide in Figure 1 to show the distribution of wins across teams.

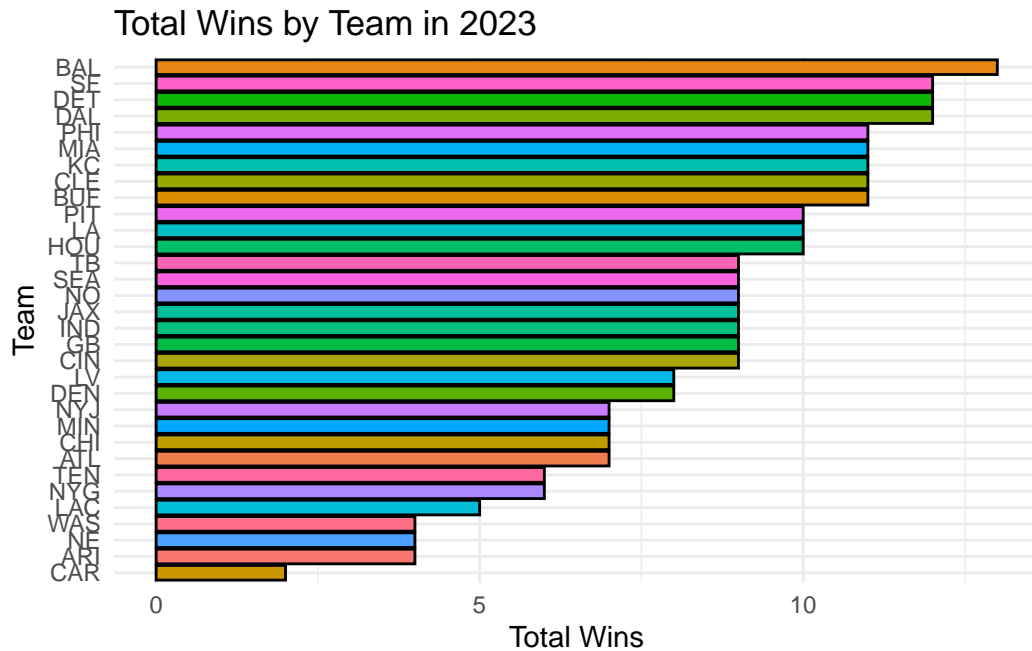


Figure 1: Total Wins by Team in 2023 - Shows the number of games each team won during the 2023 NFL regular season.

2.3.2 Playoff Qualification

This binary variable indicates whether a team participated in the postseason. A bar plot in Figure 2 visualizes the count of teams that made and missed the playoffs.

2.3.3 Point Differential

This variable measures the difference between a team’s total points scored and total points allowed across all games. A positive point differential indicates a team that scored more points than it allowed, while a negative differential suggests the opposite. Point differential serves as an important proxy for dominance, often correlating with both team wins and playoff success. A bar plot showing the average score differential across teams is included in Figure 3.

2.4 Predictor Variables

The predictor variables in this study focus on quarterback performance metrics, as they are hypothesized to be critical determinants of team success. These variables capture key aspects of quarterback contributions to their teams.

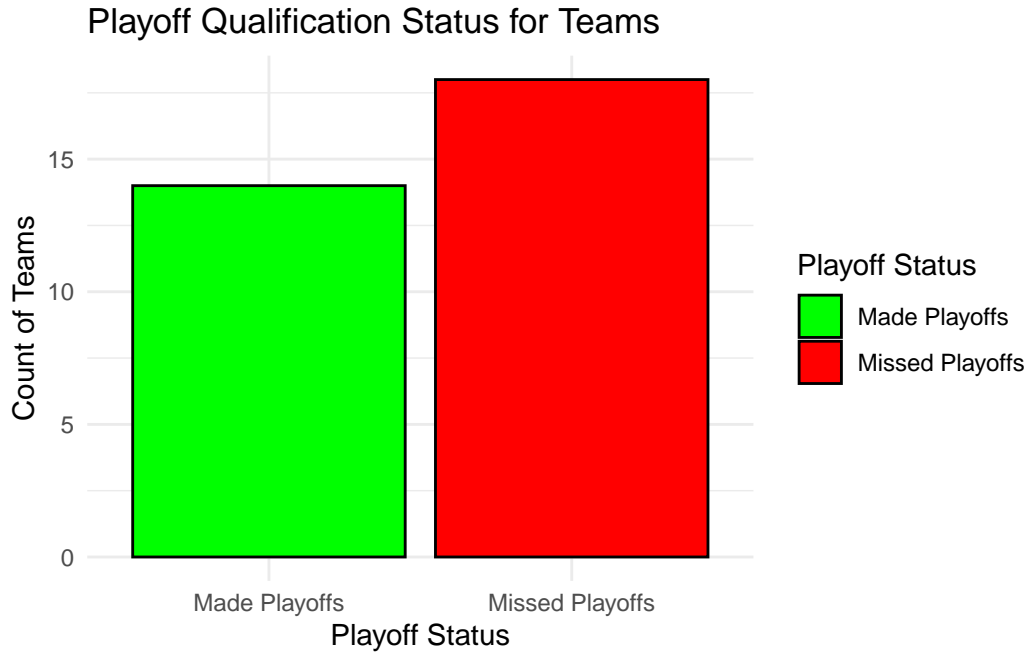


Figure 2: Playoff Qualification Status for Teams - Visualizes the number of teams that made or missed the playoffs in 2023.

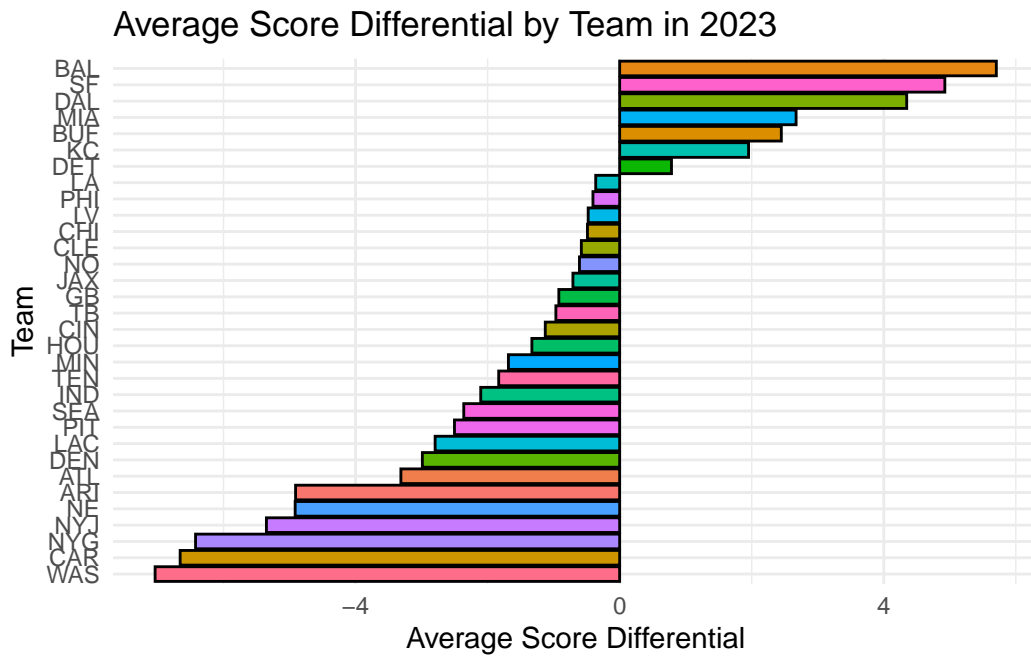


Figure 3: Average Score Differential by Team in 2023 - Highlights teams' average point differential, which indicates overall dominance or struggle.

2.4.1 Total Passing Yards

This metric represents the cumulative yards gained by a quarterback through passing during the regular season. A higher total passing yardage indicates a quarterback's ability to move the ball effectively down the field and sustain drives. The distribution of total passing yards by starting quarterbacks is visualized in Figure 4.

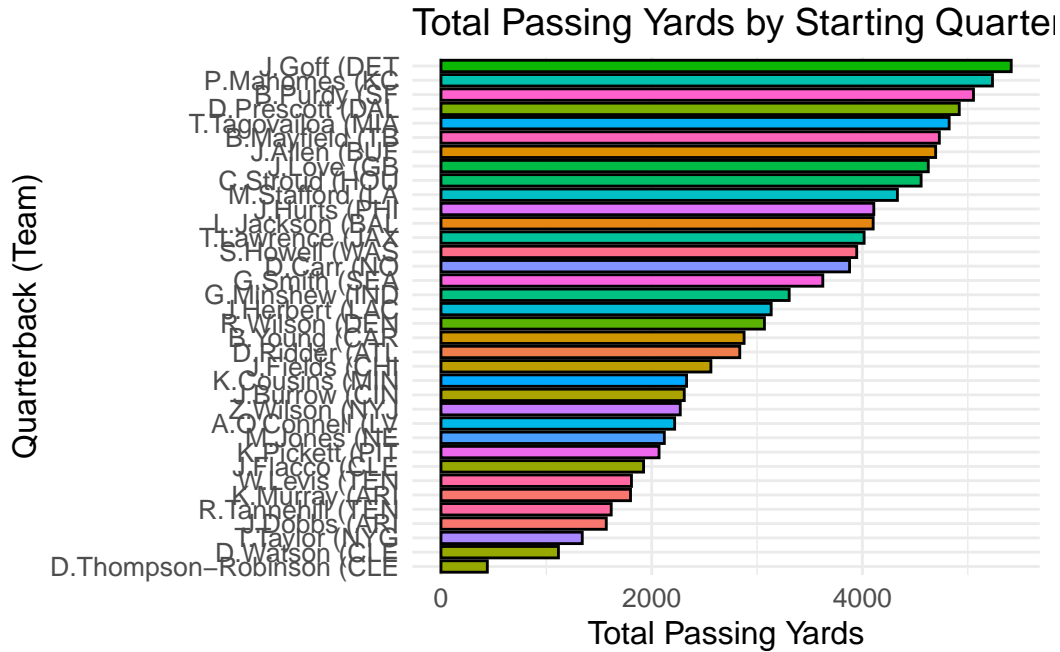


Figure 4: Total Passing Yards by Starting Quarterback in 2023

2.4.2 Total Passing Touchdowns

This metric measures the total number of touchdowns thrown by a quarterback during the regular season. It highlights a quarterback's effectiveness in converting offensive drives into scoring opportunities. The bar plot in Figure 5 shows the distribution of passing touchdowns across starting quarterbacks.

2.4.3 Total Interceptions

This metric represents the total number of passes intercepted by the opposing team. It is an important measure of quarterback decision-making and accuracy. A lower number of interceptions generally correlates with better quarterback performance. The distribution of total interceptions by starting quarterbacks is shown in Figure 6.

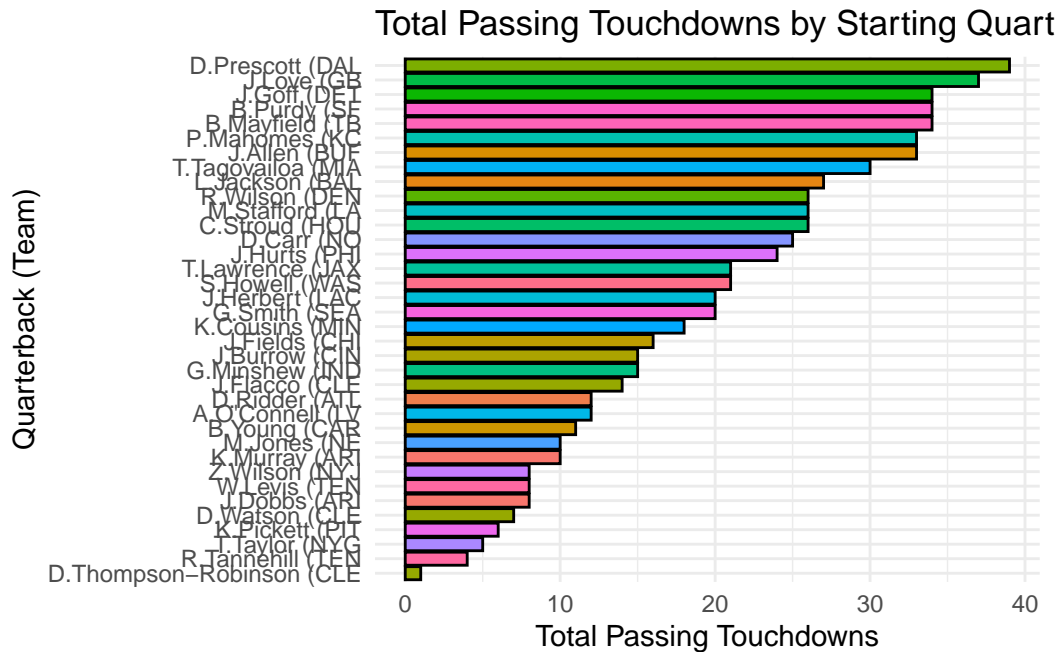


Figure 5: Total Passing Touchdowns by Starting Quarterback in 2023

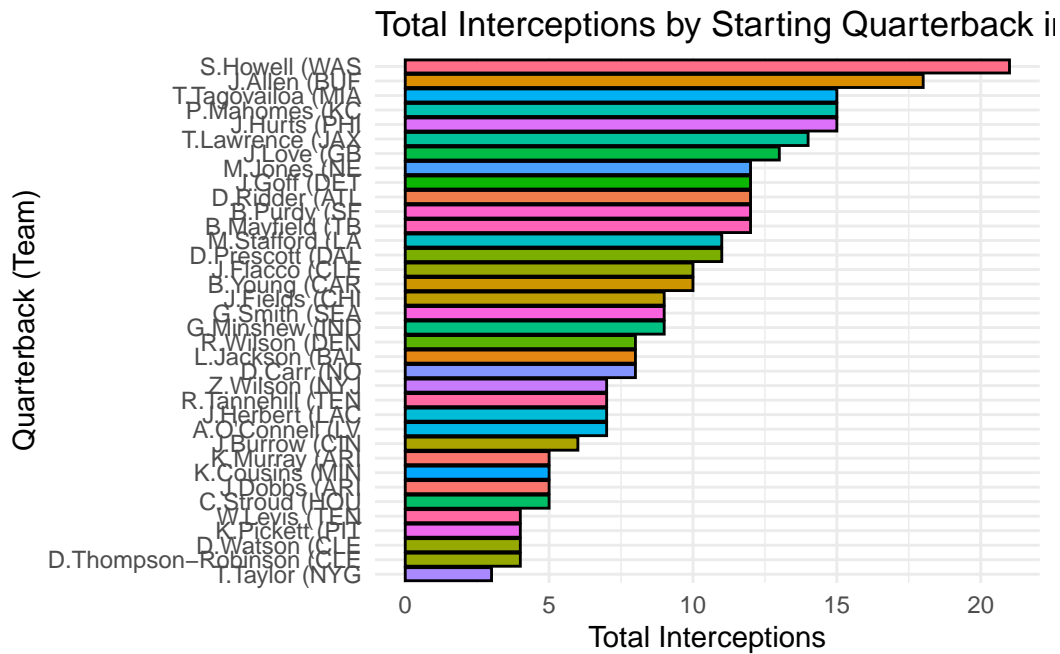


Figure 6: Total Interceptions by Starting Quarterback in 2023

These predictor variables provide a comprehensive picture of quarterback performance and are used to explore their relationships with the outcome variables. By analyzing these metrics, we aim to determine the extent to which quarterback performance influences team success.

3 Model

The goal of our modeling strategy is to evaluate the relationship between quarterback performance metrics and team success. We aim to answer the following research questions:

- To what extent do quarterback performance metrics predict total wins?
- How strongly do quarterback metrics influence playoff qualification?
- What is the relationship between quarterback performance metrics and average point differential?

We employ Bayesian regression models using the `rstanarm` package (Goodrich et al. 2022) to quantify these relationships. This framework allows us to incorporate prior information, account for uncertainty, and interpret results probabilistically.

3.1 Wins Model

The **Wins Model** predicts the total wins (y_i) for team (i) during the season as a linear combination of quarterback and team performance metrics. Specifically, we assume:

$$y_i = \beta_0 + \beta_1 \cdot PassingYards_i + \beta_2 \cdot Touchdowns_i + \beta_3 \cdot Interceptions_i \\ + \beta_4 \cdot PointsScored_i + \beta_5 \cdot ScoreDifferential_i + \epsilon_i$$

Definitions:

- y_i : Total wins for team i (continuous outcome).
- β_0 : Intercept term.
- β_k : Coefficients for predictors ($k = 1, \dots, 5$).
- σ : Residual standard deviation.

The predictors include:

- $PassingYards_i$: Total passing yards for the team's quarterback.
- $Touchdowns_i$: Total touchdowns thrown by the team's quarterback.
- $Interceptions_i$: Total interceptions thrown by the team's quarterback.
- $PointsScored_i$: Total points scored by the team.
- $ScoreDifferential_i$: Average score differential for the team.

3.1.1 Playoff Qualification Model

The **Playoff Qualification Model** predicts the likelihood of a team making the playoffs ((z_i)) as a function of quarterback and team performance metrics. Specifically, we assume:

$$\begin{aligned} \text{logit}(\Pr(z_i = 1)) = & \beta_0 + \beta_1 \cdot \text{PassingYards}_i + \beta_2 \cdot \text{Touchdowns}_i + \beta_3 \cdot \text{Interceptions}_i \\ & + \beta_4 \cdot \text{PointsScored}_i + \beta_5 \cdot \text{ScoreDifferential}_i \end{aligned}$$

Definitions:

- z_i : Playoff status for team i (binary outcome; $z_i = 1$ if the team made playoffs, $z_i = 0$ otherwise).
- β_0 : Intercept term.
- β_k : Coefficients for predictors ($k = 1, \dots, 5$).

The predictors include:

- PassingYards_i : Total passing yards for the team's quarterback.
- Touchdowns_i : Total touchdowns thrown by the team's quarterback.
- Interceptions_i : Total interceptions thrown by the team's quarterback.
- PointsScored_i : Total points scored by the team.
- $\text{ScoreDifferential}_i$: Average score differential for the team.

3.1.2 Point Differential Model

The **Point Differential Model** predicts the average point differential ((d_i)) for team (i) during the season as a linear combination of quarterback and team performance metrics. Specifically, we assume:

$$\begin{aligned} d_i = & \beta_0 + \beta_1 \cdot \text{PassingYards}_i + \beta_2 \cdot \text{Touchdowns}_i + \beta_3 \cdot \text{Interceptions}_i \\ & + \beta_4 \cdot \text{PointsScored}_i + \beta_5 \cdot \text{PointsAllowed}_i + \epsilon_i \end{aligned}$$

Definitions:

- d_i : Average point differential for team i (continuous outcome).
- β_0 : Intercept term.

- β_k : Coefficients for predictors ($k = 1, \dots, 5$).
- σ : Residual standard deviation.

The predictors include:

- PassingYards_{*i*}: Total passing yards for the team's quarterback.
- Touchdowns_{*i*}: Total touchdowns thrown by the team's quarterback.
- Interceptions_{*i*}: Total interceptions thrown by the team's quarterback.
- PointsScored_{*i*}: Total points scored by the team.
- PointsAllowed_{*i*}: Total points allowed by the team.

3.2 Model Results

3.2.1 Wins Model

The Wins Model examines how quarterback metrics predict total wins. The coefficients suggest that total touchdowns and interceptions have small but negative impacts on wins, with the following key results:

Table 1: Summary of the Bayesian Wins Model

Parameter	Median	MAD_SD
(Intercept)	1.0	2.0
Total Passing Yards	0.0	0.0
Total Touchdowns	0.0	0.1
Total Interceptions	-0.1	0.1
Total Points Scored	0.0	0.0
Avg. Score Differential	0.0	0.0
Sigma	1.6	0.2

The residual standard deviation (σ) was estimated at 1.6, indicating moderate unexplained variability.

3.2.2 Playoff Qualification Model

The Playoff Model investigates the likelihood of making the playoffs. The logistic regression results show minimal impact from all predictors:

Table 2: Summary of the Bayesian Playoff Qualification Model

Parameter	Median	MAD_SD
(Intercept)	-2.0	3.2
Total Passing Yards	0.0	0.0
Total Touchdowns	-0.1	0.1
Total Interceptions	-0.1	0.2
Total Points Scored	0.0	0.0
Avg. Score Differential	0.0	0.0

The model suggests that other factors beyond quarterback performance may play a larger role in determining playoff qualification.

3.2.3 Point Differential Model

This model evaluates the average score differential as a measure of team dominance. Results indicate that total touchdowns and interceptions have some negative impact:

Table 3: Summary of the Bayesian Point Differential Model

Parameter	Median	MAD_SD
(Intercept)	-28.4	110.3
Total Passing Yards	0.0	0.0
Total Touchdowns	-0.7	3.3
Total Interceptions	-2.7	3.8
Total Points Scored	0.0	0.0
Total Points Allowed	0.0	0.0
Sigma	64.5	8.6

The residual standard deviation (σ) was 64.5, reflecting high variability in average point differentials.

4 Results

The results across all models indicate that quarterback metrics have limited direct predictive power for wins, playoff qualification, and point differential. While some metrics, such as interceptions, show modest negative relationships, their overall effect sizes are small. This suggests that other team factors, such as defense, special teams, or coaching, may play larger roles in determining success.

This modeling framework demonstrates the utility of Bayesian regression for evaluating complex relationships in sports analytics. However, the small effect sizes for quarterback metrics suggest a need to explore other dimensions of team success. Future work could incorporate hierarchical models to account for team-level variability or include additional contextual variables, such as offensive line performance or coaching strategies.

5 Discussion

The role of quarterbacks (QBs) is examined to see their impact in team success within the NFL, focusing on total wins, playoff qualification, and average point differential. Using Bayesian regression models, we analyzed how QB performance metrics such as passing yards, touchdowns, and interceptions relate to these outcomes. While QBs are often viewed as the cornerstone of a football team, our findings suggest their impact is part of a larger, multifaceted system, echoing arguments made in (Way 2023; ScholarWorks 2024).

5.1 Findings

5.1.1 Important vs. Essential

QBs contribute to team success, but their influence is not all-encompassing. Metrics like interceptions were found to have a small but negative impact on wins and playoff chances, aligning with the understanding that turnovers often hinder team performance. However, their overall impact was modest compared to other factors, such as defensive capabilities or coaching strategies. This supports the critique in (Way 2023) that the “QB win” statistic is often overstated as a standalone metric.

Similarly, while touchdowns positively influenced team success, their effect was smaller than anticipated. This reinforces the idea that football is fundamentally a team sport where success relies on multiple components. As discussed in (Times 2014), elements such as offensive line performance, wide receiver effectiveness, and defensive strength all play critical roles in determining outcomes. Even elite quarterbacks struggle without adequate protection or a strong supporting cast.

5.1.2 Football is a Team Game

Success in football depends on the interconnected roles of various team components. A quarterback’s performance is tied to the offensive line’s ability to block defenders, wide receivers’ ability to execute routes and catch passes, and the defense’s ability to limit the opponent’s scoring. This interconnectedness makes it challenging to isolate the quarterback’s contribution to team success. (ScholarWorks 2024) emphasizes the importance of synergy between

team members, highlighting how collective performance drives outcomes more than individual contributions.

5.1.3 Leadership Matters

Beyond measurable statistics, QBs often serve as leaders on the field. They are responsible for calling plays, reading defenses, and maintaining focus during high-pressure moments. These intangible qualities, though difficult to quantify, are a significant factor in the success of players like Patrick Mahomes and Tom Brady. Leadership, as argued in (ScholarWorks 2024), is especially critical in high-stakes scenarios where decision-making and mental toughness are essential. While these traits were not directly captured in our models, they undoubtedly play a role in team outcomes.

5.2 Weaknesses and Limitations

5.2.1 Correlation vs. Causation

The observed relationships between QB statistics and team success do not imply causation. For instance, teams with more wins might accumulate higher passing yards because they play from a position of strength, rather than passing yards directly causing wins. This issue, discussed in (Journals 2019), highlights the difficulty of isolating causative factors in sports analytics. While our models provide valuable insights into these relationships, they cannot definitively separate cause and effect.

5.2.2 External Factors

Our analysis focused on QB performance metrics, but many other variables influence team success. Factors such as coaching strategies, injuries, schedule difficulty, and weather conditions all play significant roles. As (Times 2014) argues, accounting for these contextual elements is essential for a more comprehensive understanding of team performance.

5.2.3 Simplified Outcomes

We examined season-long outcomes like total wins and playoff qualification, which, while important, do not capture the full complexity of football. For instance, some QBs may excel in critical moments, such as game-winning drives or playoff scenarios, which were not captured in this analysis. Future research could benefit from situational analyses, as suggested in (Way 2023).

5.3 Future Direction

5.3.1 Use Better Data

Advanced metrics from platforms like NFL Next Gen Stats could provide deeper insights into quarterback performance. For example, data on release times, accuracy under pressure, and movement tracking could offer a more nuanced understanding, as suggested in (Journals 2019).

5.3.2 Look at Interactions

Future research could explore interactions between quarterbacks and other team units. For instance, examining how offensive line performance influences QB metrics or how star receivers elevate a quarterback's effectiveness could provide a more complete picture of team dynamics.

5.3.3 Expand the Scope

Analyzing multiple seasons or specific scenarios, such as playoff games or fourth-quarter performances, could yield additional insights. This approach would account for variability across teams and situations, providing a broader understanding of quarterback contributions.

5.4 Importance of Research

This study contributes to ongoing discussions about the role of quarterbacks in football. While quarterbacks are undoubtedly key players, the findings suggest they are part of a larger system where balance and complementary team components are critical. These results have practical implications for team-building strategies, suggesting that over-investing in quarterbacks at the expense of other areas may not always yield optimal outcomes. The San Francisco 49ers' recent success, built on a balanced roster and strong defense, serves as a case in point.

Ultimately, football remains a team sport. Even the best quarterbacks cannot succeed in isolation. By broadening the focus beyond individual players, this analysis highlights the importance of understanding the bigger picture in football success.

6 Conclusion

This study examines the relationship between quarterback performance and team success in the NFL, focusing on metrics like passing yards, touchdowns, and interceptions. While quarterbacks are undeniably important, the results highlight the interconnected nature of football, where complementary factors like defense and offensive line performance are equally critical.

By challenging the oversimplified view of quarterbacks as the sole drivers of success, this research underscores the value of a balanced team strategy. These findings inform ongoing debates about quarterback value and provide practical implications for team-building strategies in the NFL.

Appendix

Based on the requirements and the provided document structure, here's a proposed appendix focusing on the methodology, particularly the challenges and nuances of observational data in the context of NFL performance analytics. It mirrors the depth and structure seen in Paper 2.

.1 Observational Data in NFL Performance Analysis

Observational data refers to information collected without experimental manipulation, capturing events as they naturally occur. In the realm of sports analytics, this encompasses game statistics, player movements, and other performance metrics recorded during competitions. Such data is invaluable for understanding patterns and outcomes in sports. However, its non-experimental nature introduces challenges, particularly concerning confounding variables and establishing causality.

.1.1 Data Collection and Sampling Biases

The primary dataset for this study comprises play-by-play data from the 2023 NFL regular season. While this dataset offers a comprehensive snapshot of that season, it is subject to several limitations:

- **Temporal Bias:** Focusing on a single season may not account for variations across different seasons, such as rule changes, player injuries, or team dynamics. This can lead to conclusions that are not generalizable beyond the 2023 season.
- **Survivorship Bias:** Teams and players that performed poorly may have less complete data due to factors like early elimination from playoff contention, potentially skewing analyses toward more successful teams.
- **Measurement Error:** Inconsistencies in data recording, whether due to human error or technological limitations, can introduce inaccuracies that affect the reliability of analyses.

Addressing these biases is crucial for ensuring the validity of any conclusions drawn from the data.

.1.2 Bayesian Regression Models in Sports Analytics

To analyze the relationship between quarterback performance and team success, we employed Bayesian regression models. This approach offers several advantages:

- **Incorporation of Prior Knowledge:** Bayesian methods allow for the integration of existing knowledge or expert opinion into the analysis, providing a more informed framework for understanding relationships within the data.
- **Quantification of Uncertainty:** Unlike traditional frequentist methods, Bayesian regression provides a probabilistic interpretation of model parameters, offering a clearer picture of the uncertainty associated with estimates.
- **Flexibility in Modeling Complex Relationships:** The Bayesian framework is adept at handling complex hierarchical structures and interactions, which are common in sports data.

However, the application of Bayesian regression in sports analytics is not without challenges:

- **Computational Intensity:** Bayesian methods often require sophisticated algorithms and significant computational resources, especially with large datasets typical in sports analytics.
- **Selection of Priors:** Choosing appropriate prior distributions is critical, as they can significantly influence results. This selection process requires careful consideration and, ideally, should be informed by domain expertise.

Despite these challenges, Bayesian regression has been successfully applied in various sports contexts. For instance, a comprehensive review by López et al. (2018) highlights the growing popularity of Bayesian methods in sports analytics, citing their ability to model complex problems and provide probabilistic estimates that account for uncertainty.

.1.3 Addressing Confounding Variables

In observational studies, confounding variables can obscure the true relationship between variables of interest. In the context of NFL performance, factors such as team defense quality, coaching strategies, and player injuries can confound the relationship between quarterback performance and team success.

To mitigate the impact of confounders, we incorporated relevant covariates into our Bayesian regression models. This approach allows for the adjustment of these variables, providing a clearer understanding of the specific impact of quarterback performance on team outcomes.

.1.4 Simulation and Validation

To assess the robustness of our models, we employed simulation techniques. By generating synthetic datasets that mimic the characteristics of the observed data, we evaluated the performance of our models under various scenarios. This process helps in understanding the

potential variability in outcomes and ensures that the models are not overfitting to the specific dataset.

Simulation also facilitates sensitivity analysis, allowing us to examine how changes in key variables affect team success. For example, by simulating different levels of quarterback performance, we can estimate the potential impact on the number of games won, providing valuable insights for strategic decision-making.

.2 Ethical Considerations

The use of observational data in sports analytics raises important ethical considerations, particularly regarding player evaluation and team strategies. Misinterpretation of data can lead to unfair assessments of player performance, influencing contract decisions and career trajectories.

To address these concerns, we adhered to ethical guidelines that emphasize transparency, accountability, and the responsible use of data. This includes:

- **Transparent Methodology:** Clearly documenting data sources, analytical methods, and any assumptions made during the analysis.
- **Reproducibility:** Ensuring that analyses can be replicated by others, which is fundamental for validating findings and building trust in the results.
- **Respect for Stakeholders:** Considering the potential impact of analyses on players, teams, and fans, and striving to present findings in a fair and unbiased manner.

By adhering to these principles, we aim to contribute to the field of sports analytics in a manner that is both scientifically rigorous and ethically sound.

This appendix has explored the methodological considerations involved in analyzing observational data within the context of NFL performance. By addressing challenges related to data collection, sampling biases, confounding variables, and the application of Bayesian regression models, we have outlined a comprehensive approach to understanding the complex dynamics of team success. Through careful attention to these factors, our analysis provides insights that are both robust and meaningful, contributing to the broader field of sports analytics.

.3 Survey

Survey link: <https://forms.gle/jncb2jsLwUcfMuPp7> This survey aims to get insight of users on the thought of how quarterbacks are important to nfl teams.

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