

## I. ABSTRACT

This study examines the impact of player injuries on NFL team win probabilities over the seasons 2013 to 2019. The research dissects the data by the number of injuries, overall team influence, and the effect at each position. The findings suggest that injuries have a variable impact on win probabilities, with certain positions showing a more pronounced effect.

## II. EXPLORING POSITION LEVEL DATA

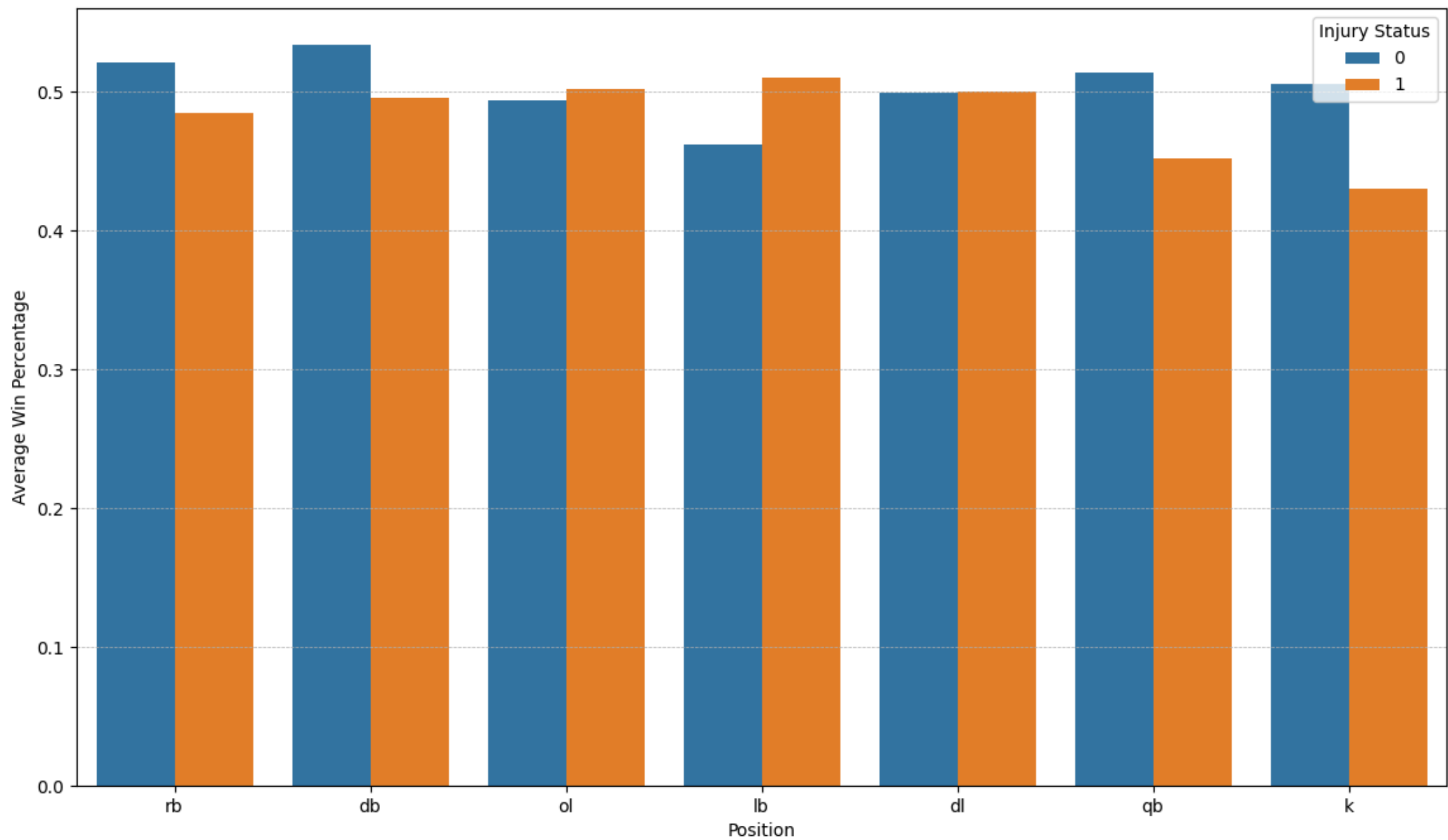


Figure 1: Averaging win variable (binary) when a position is hurt or not

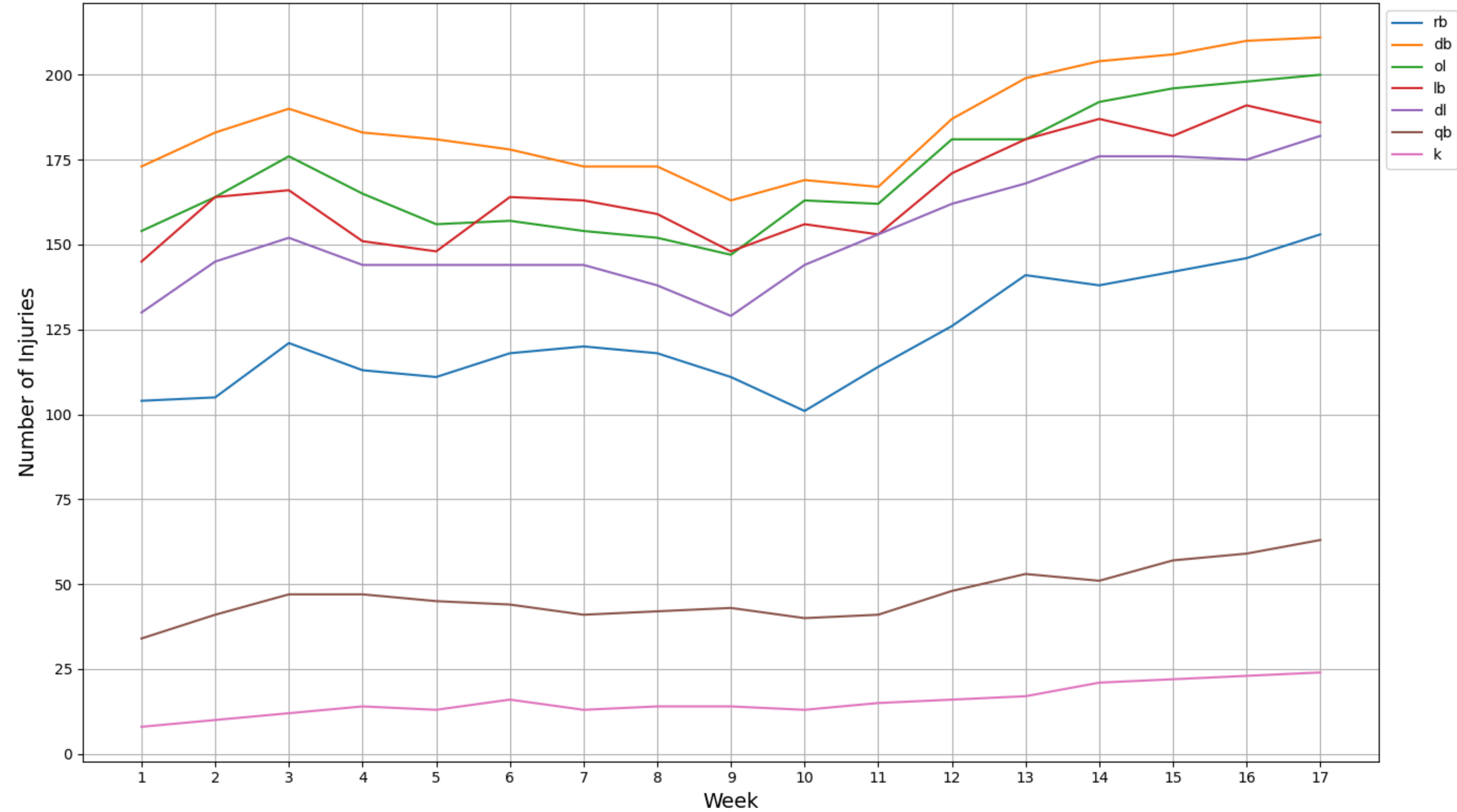


Figure 2: Summing injury dummies over the course of a season

## III. EXPLORING TEAM LEVEL DATA

- Worst Performers: Cleveland, Jacksonville, Tampa Bay, and Washington, New York (G) were the lowest performing teams
- QB Injuries: Cincinnati, Minnesota, Cleveland, Carolina, and Pittsburgh had the most injuries at QB
- Worst Ranked: Top five in losses also show high ranks in injuries occurance across most significant positions.

team	win	Total_Injuries
Cleveland Browns	28	0.0
Jacksonville Jaguars	36	0.0
Tampa Bay Buccaneers	38	0.0
New York Giants	42	0.0
Washington Football Team	42	0.0
New York jets	43	0.0
Oakland Raiders	43	0.0
Chicago Bears	47	0.0
Tennessee Titans	48	0.0
Miami Dolphins	50	0.0
San Francisco 49ers	50	0.0
Atlanta Falcons	53	0.0
Detroit Lions	53	0.0
Los Angeles Chargers	53	0.0
Houston Texans	54	0.0
Buffalo Bills	55	0.0
Cincinnati Bengals	55	0.0
Arizona Cardinals	57	0.0
Los Angeles Rams	57	0.0
Indianapolis Colts	59	0.0
Carolina Panthers	63	0.0
Baltimore Ravens	64	0.0
Dallas Cowboys	64	0.0
Denver Broncos	64	0.0
Minnesota Vikings	64	0.0
Philadelphia Eagles	65	0.0
Green Bay Packers	66	0.0
New Orleans Saints	69	0.0
Pittsburgh Steelers	71	0.0
Seattle Seahawks	76	0.0
Kansas City Chiefs	77	0.0
New England Patriots	86	0.0

Figure 3: Worst Teams and Ranks by Occurance of Injury in a Position Group

## IV. MODEL

To investigate the impact of injuries on team performance, we employed a logistic regression model. This model allowed us to control for team-specific effects and incorporate dummy variables for each position, indicating whether an injury was present.

The logistic regression equation can be represented as follows:

$$\log\left(\frac{P(Y = 1)}{1 - P(Y = 1)}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n \quad (1)$$

Where: -  $P(Y = 1)$  is the probability of a team winning given the set of predictors. -  $\beta_0$  is the intercept. -  $\beta_1, \beta_2, \dots, \beta_n$  are the coefficients for each predictor  $X_1, X_2, \dots, X_n$ , including team effects and injury status for each position.

This model allows us to quantify the impact of injuries across different positions on the likelihood of a team’s win, adjusting for inherent team strengths and weaknesses.

i. Looking at interactions for signifcant positions

Position	Coefficient	P-value	95% CI Lower	95% CI Upper
Running Back	-0.107	0.12	-0.243	0.028
Defensive Back	-0.114	0.273	-0.319	0.09
Offensive Lineman	0.035	0.686	-0.134	0.204
Linebacker	0.181	0.029	0.018	0.343
Defensive Lineman	0.013	0.865	-0.136	0.162
Tight End	0.16	0.018	0.027	0.292
Wide Receiver	-0.212	0.005	-0.36	-0.064
Punter	0.158	0.433	-0.238	0.554
Long Snapper	-0.262	0.105	-0.578	0.054
Quarterback	-0.267	0.001	-0.427	-0.106
Kicker	-0.268	0.04	-0.525	-0.012

Figure 4: Weights and Statistical Significance by Positions

ii. Key Findings on Position Impact

- Significant Impact: QBs, RBs, WRs, and Kickers correlate strongly with win probabilities.
- Positive Surprises: TEs and LBs show unexpected positive effects on wins.
- Insight: Positions traditionally seen in support roles may have underrated contributions to team success.

All findings are statistically significant, highlighting areas for strategic team development.

## V. CONCLUSION

Our findings highlight the nuanced impact of player injuries on NFL teams’ performance. The logistic regression model revealed that certain positions are more critical to a team’s win probability. This analysis contributes to a deeper understanding of strategic team management and injury prevention in professional sports.