Goal Differential: Home vs. Away (English Premier League Edition)

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Hypothesis: Home field advance results in better Goal differentials

We aimed to quantify Home Field Advantage (HFA) in the English Premier League, as determined by Goal Differential.

Additionally, we explored one factor that could of impact HFA. Does larger attendance (or crowd size) result in large HFA.

Background: Home field advance in Premier League

In soccer, being the home team can provide a huge advantage. Factors like fans, playing on your own turf, and things as simple as having your own trainers with you can make the difference in a game.

In the English Premier League (EPL), top class teams tend to stay at the top of the ladder for both home and away results, it is very interesting to see the difference being the home team can make for a soccer team.

Procedure:

Obtained EPL data for: 2016-2017 | 2017-2018 | 2018-2019 seasons Goal differential _{home or away} = (total goals for – total goal against) / (number of games) HFA = GD_{Home} - GD_{Away} Analysis conducted in R

Code:

```
library(tidyverse)
    setwd("~/Desktop/english-premier-league_zip")
    bpl <- read_csv("data/season-1819_csv.csv") %>%
      rename(Goals_For = FTHG.
            Goals_Against = FTAG)
 9
10
11 bpl.home.summary <- bpl %>%
12
     group_by(HomeTeam) %>%
13
      summarize(Total_Goals_For = sum(Goals_For),
14
                t_goals_against = sum(Goals_Against)) %>%
15
     unaroup() %>%
16
      rename(Team = HomeTeam) %>%
17
      mutate(Home = "Home")
18
19
20
21 bpl.away.summary <- bpl %>%
22
      group_by(AwayTeam) %>%
23
      summarize(Total_Goals_For = sum(Goals_Against),
24
                t_goals_against = sum(Goals_For)) %>%
25
     ungroup() %>%
26
     rename(Team = AwayTeam) %>%
27
     mutate(Home = "Away")
28
29
30 season <- rbind(bpl.home.summary, bpl.away.summary)
31
32
33
34
    season <- season %>% mutate(GD = Total_Goals_For - t_goals_against, GDPG = GD/19)
35
36
37 season <- season %>%
38
     group_by(Team) %>%
39
      summarise(HFA = sum(GDPG)) %>%
40
      ungroup()
41
```

2 Arsenal 31 35 Away 3 Bournemouth 30 25 Home 4 Bournemouth 26 45 Wawy - 5 Brighton 19 28 Home - 6 Brighton 16 23 Home - 7 Burnley 24 32 Home - 7 Burnley 21 36 Away - 9 Cardiff 213 33 Away - 10 Cardiff 213 133 Away - 11 Chelsa 39 12 Home - 12 Chelsa 24 27 Away - 13 Crystal Palace 30 30 Away - 14 Crystal Palace 30 30 Away - 15 Everton 30 140 - - 14 Crystal Palace 30 30 - 15 Everton 23 Home - 16 Everton 24 400 - 17 Fulham 12 Away - <td< th=""><th>¢</th><th>Team 🔷</th><th>Total_Goals_For</th><th>t_goals_against 🗧</th><th>Home 0</th><th>GD 0</th></td<>	¢	Team 🔷	Total_Goals_For	t_goals_against 🗧	Home 0	GD 0
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Bighton 1 0 0 0 6 Brighton 16 28 More 7 Burley 24 22 More 7 Burley 24 32 More 8 Burley 21 36 Away - 9 Cardiff 21 36 Away - 10 Cardiff 33 31 Away - 11 Chelsea 39 12 Home - 12 Chelsea 29 3 Mome - 13 Crystal Palace 29 3 Mome - 14 Crystal Palace 29 3 Mome - 15 Everton 30 21 Home - 15 Everton 23 Mome - - 16 Everton 24 Away - - 17 Fulham 22 Away	3	Bournemouth	30	25	Home	5
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7 Burnley 24 32 Home 8 Burnley 21 36 Away - 9 Cardiff 21 38 Home - 10 Cardiff 13 31 Away - 11 Chelsea 24 27 Away - 12 Chelsea 24 27 Away - 13 Crystal Falace 19 23 Home - 14 Crystal Falace 32 30 Away - 15 Everon 30 24 - - 16 Everon 23 Home - - 17 Fulham 22 30 Away - 20 Hoiddersfiel 12 45 Away - 21 Leicester 27 28 Away - 22 Leicester 27 28 Away - 23 Lorepool 55 10 Home - 24 Levepool 34 12 Away - 25 Man City 57 12 Home - 26 ManCity 38	5	Brighton	19	28	Home	-9
8 Burnley 2 3 4 4 9 Cardiff 21 38 4 4 9 Cardiff 33 31 4 4 10 Cardiff 33 31 4 4 11 Chelsea 39 31 4 4 12 Chelsea 39 31 4 4 12 Chelsea 24 27 A 4 13 Crystal Palace 39 32 4 4 14 Crystal Palace 32 30 3 4 15 Everton 30 32 4 4 16 Everton 30 3 4 4 20 Huddersfield 10 31 4 4 20 Huddersfield 10 31 4 4 21 Leicester 27 3 4 4 22	6	Brighton	16	32	Away	-16
9 Cardiff 1 3 Home 10 Cardiff 1 3 3 4 4 10 Cardiff 1 3 1 4 4 11 Chelsea 39 12 Home 1 12 Chelsea 24 27 Away 1 13 Crystal Palace 32 3 Home 1 14 Crystal Palace 30 3 4 3 15 Everton 3 3 4 3 16 Everton 23 4 4 3 17 Fulham 22 36 4 4 19 Huddersfield 101 3 4 120 Huddersfield 12 4 4 19 Huddersfield 13 4 4 121< Leicester 27 28 A 4 122 Leicester 27 28 A 4 123 Levepool 35 10 Home 4 124 Levepool 33 25 4 4 125 Man City 33 3 3 <	7	Burnley	24	32	Home	-8
10 Cardiff 11 Away - 11 Chelsea 39 12 Away 12 Chelsea 39 12 Mome 13 Crystal Palace 19 23 Home 14 Crystal Palace 19 23 Home 15 Evenon 300 21 Home 16 Evenon 24 275 Away 17 Fulham 22 36 Home 19 Huddersfield 31 400 3 20 Huddersfield 131 Away - 21 Lecester 27 28 Away 22 Lecester 27 28 Away 23 Lwerpool 35 10 Home 24 Lwerpool 35 10 Home 23 Lwerpool 35 10 Home 24 Lwerpool 36 14 Away 25 Man City 38 11 Away 24 Lwerpool 33 25 Home 25 Man City 38 23 Jeme 26 Man City 38 29	8	Burnley	21	36	Away	-15
11 Chelsea 39 12 Mome 12 Chelsea 24 27 Away 13 Crystal Palace 9 23 Mome 14 Crystal Palace 22 30 Away 15 Everton 300 21 Mome 16 Everton 300 21 Mome 17 Fulham 22 36 Home 18 Fulham 22 36 Mome 19 Huddersfiel 10 31 Home 20 Huddersfiel 12 Away - 21 Leicester 27 28 Away 22 Leicester 27 28 Away 23 Lorepool 35 10 Home 24 Leverpool 35 10 Home 25 Man City 38 21 Away 26 Man City 33 25 Home 25 Man City 33 25 Home 26 Man City 33 25 Home 27 Man United 32 29 Away 27 Man United 32 4	9	Cardiff	21	38	Home	-17
12 Chelsea 24 27 Away 13 Crystal Palace 19 23 Home 14 Crystal Palace 32 30 Away 15 Everton 30 21 Home 16 Everton 24 23 Away 17 Fulham 22 36 Home 18 Fulham 22 36 Away 20 Huddersfiel 10 31 Home 21 Leicester 24 20 Away 22 Leicester 27 28 Away 23 Leicester 27 10 Home 24 Leverpol 38 11 Away 25 Man City 38 23 Home 24 Leverpol 38 21 Home 25 Man City 38 23 Home 26 Man City 33 25 Home 27 Man United 32 29 Away 27 Man United 32 36 36 27 Man United 32 29 Away 28 Man United 32 4	10	Cardiff	13	31	Away	-18
13 Crystal Palace 10 23 Home 14 Crystal Palace 22 30 Away 15 Everton 30 21 Home 16 Everton 24 25 Away 17 Fulham 22 36 Home 18 Fulham 22 36 Home 20 Huddersfield 10 31 Home 21 Leicester 24 20 Home 22 Leicester 27 28 Away 23 Leverpol 35 10 Home 24 Leropol 34 12 Away 25 Man City 38 11 Away 26 Man City 33 25 Home 27 Man United 33 25 Home 28 Man City 33 25 Home 28 Man City 33 25 Home 28 Man City 33 25 Home 29 Newcastle 24 25 Home	11	Chelsea	39	12	Home	27
11 Crystal Palace 32 33 Away 15 Everton 30 21 Home 16 Everton 30 22 Away 17 Fuhlam 22 36 Home 18 Fuhlam 22 36 Home 19 Huddersfield 101 31.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4	12	Chelsea	24	27	Away	-3
11 Everton 30 21 Home 16 Everton 24 25 Away 17 Fulham 22 36 Home - 18 Fulham 22 36 Away - 19 Huddersfield 101 45 Away - 20 Huddersfield 12 45 Away - 21 Leicester 27 28 Away - 22 Leicester 27 28 Away - 23 Lverpool 35 101 Home - 24 Lverpool 38 12 Away - 25 Man City 38 311 Away - 26 Man City 33 25 Home - 27 Man United 32 29 Away - 28 Man United 32 29 Away - 29 Nevcastle 24 23 Home -	13	Crystal Palace	19	23	Home	-4
16 Everton 24 25 Away 17 Fulham 22 36 Home - 18 Fulham 12 45 Away - 19 Huddersfield 10 31 Home - 20 Hoddersfield 12 Away - 21 Leicester 24 20 Home 22 Leicester 27 28 Away 23 Liverpool 55 10 Home 24 Liverpool 344 12 Away 25 Man City 57 12 Home 26 Man City 33 25 Home 27 Man United 33 25 Home 28 Man-Linked 32 29 Away 29 Nevasite 24 25 Home	14	Crystal Palace	32	30	Away	2
17 Fulham 22 36 Home - 18 Fulham 12 45 Away - 19 Huddersfield 10 31 Home - 20 Huddersfield 12 45 Away - 21 Leicester 24 20 Home - 22 Leicester 27 28 Away - 22 Leicester 27 28 Away - 23 Lerpool 34 12 Away - 24 Leicester 27 28 Away - 24 Leicester 33 21 Home - 25 Man City 38 11 Away - 26 Man City 38 11 Away - 27 Man Lined 33 29 Away - 28 Man Lined 32 29 Away -	15	Everton	30	21	Home	9
18 Fulham 12 44way 19 Huddersfield 10 31 Home 20 Huddersfield 12 45 Away - 21 Leicester 24 20 Home - 22 Leicester 27 28 Away - 23 Lerepool 35 10 Home - 24 Lerepool 34 12 Away - 26 Man City 38 11 Away - 26 Man City 33 25 Home - 28 Manhufed 32 29 Away - 29 Newcastle 24 25 Home -	16	Everton	24	25	Away	-1
19 Huddersfield 10 31 Home - 20 Huddersfield 12 45 Away - 21 Leicester 24 20 Home - 22 Leicester 27 28 Away - 23 Liverpool 55 10 Home - 24 Leropol 34 12 Away - 25 Man City 57 12 Home - 26 Man City 38 11 Away - 27 Man United 33 25 Home - 27 Man United 32 29 Away - 29 Newcastle 24 25 Home -	17	Fulham	22	36	Home	-14
20 Huddersfield 11 45 Away - 21 Leicester 24 20 Home - 22 Leicester 27 28 Away - 23 Liverpool 55 10 Home - 24 Liverpool 34 12 Away 25 Man City 57 12 Home 26 Man City 38 11 Away 27 Man United 32 25 Home 28 Man United 32 2 Home 29 Nexexsite 24 25 Home	18	Fulham	12	45	Away	-33
21 Leicester 24 20 Home 22 Leicester 27 28 Away 23 Lwrpool 55 10 Home 24 Lwrpool 35 10 Home 25 Man City 34 12 Away 25 Man City 57 12 Home 26 Man City 38 11 Away 27 Man United 33 25 Home 28 Man United 32 29 Away 27 Newcasite 24 29 Away	19	Huddersfield	10	31	Home	-21
22 Leicester 27 28 Away 23 Liverpool 55 10 Home 24 Liverpool 34 12 Away 25 Man City 57 12 Home 26 Man City 38 11 Away 27 Man United 33 25 Home 28 Man United 22 Away 29 Newcastle 24 25 Home	20	Huddersfield	12	45	Away	-33
23 Lverpool 55 10 Home 24 Lverpool 34 12 Away 25 Man City 57 12 Home 26 Man City 38 11 Away 27 Man United 33 25 Home 28 Man United 32 29 Away 29 Newcastle 24 25 Home 30 Newcastle 18 23 Away	21	Leicester	24	20	Home	4
24 Lherpool 34 12 Away 25 Man City 57 12 Home 26 Man City 38 11 Away 27 Man United 33 25 Home 28 Man United 32 29 Away 29 Newcastle 24 25 Home 30 Newcastle 18 23 Away	22	Leicester	27	28	Away	-1
25 Man City 57 12 Home 26 Man City 38 11 Away 27 Man United 33 25 Home 28 Man United 32 29 Away 28 Man United 32 29 Away 29 Newcastle 24 25 Home 30 Newcastle 18 23 Away	23	Liverpool	55	10	Home	45
26 Man City 38 11 Away 27 Man Uniked 33 25 Home 28 Man Uniked 32 29 Away 29 Newcastle 24 25 Home 30 Newcastle 18 23 Away	24	Liverpool	34	12	Away	22
27 Man United 33 25 Home 28 Man United 32 29 Away 29 Newcastle 24 25 Home 30 Newcastle 18 23 Away	25	Man City	57	12	Home	45
28 Man United 32 29 Away 29 Newcastle 24 25 Home 30 Newcastle 18 23 Away	26	Man City	38	11	Away	27
29 Newcastle 24 25 Home 30 Newcastle 18 23 Away	27	Man United	33	25	Home	8
30 Newcastle 18 23 Away	28	Man United	32	29	Away	3
	29	Newcastle	24	25	Home	-1
31 Southampton 27 30 Home	30	Newcastle	18	23	Away	-5
	31	Southampton	27	30	Home	-3

Season 16-17 data

^	Team 🍦	Total_Goals_For 🔅	t_goals_against 🗦	Home 🍦	GD 🗘
1	Arsenal	39	16	Home	23
2	Bournemouth	35	29	Home	6
3	Burnley	26	20	Home	6
4	Chelsea	55	17	Home	38
5	Crystal Palace	24	25	Home	-1
6	Everton	42	16	Home	26
7	Hull	28	35	Home	-7
8	Leicester	31	25	Home	6
9	Liverpool	45	18	Home	27
10	Man City	37	17	Home	20
11	Man United	26	12	Home	14
12	Middlesbrough	17	23	Home	-6
13	Southampton	17	21	Home	-4
14	Stoke	24	24	Home	0
15	Sunderland	16	34	Home	-18
16	Swansea	27	34	Home	-7
17	Tottenham	47	9	Home	38
18	Watford	25	29	Home	-4
19	West Brom	27	22	Home	5
20	West Ham	19	31	Home	-12

21	Arsenal	38	28	Away	10
22	Bournemouth	20	38	Away	-18
23	Burnley	13	35	Away	-22
24	Chelsea	30	16	Away	14
25	Crystal Palace	26	38	Away	-12
26	Everton	20	28	Away	-8
27	Hull	9	45	Away	-36
28	Leicester	17	38	Away	-21
29	Liverpool	33	24	Away	9
30	Man City	43	22	Away	21
31	Man United	28	17	Away	11
32	Middlesbrough	10	30	Away	-20
33	Southampton	24	27	Away	-3
34	Stoke	17	32	Away	-15
35	Sunderland	13	35	Away	-22
36	Swansea	18	36	Away	-18
37	Tottenham	39	17	Away	22
38	Watford	15	39	Away	-24
39	West Brom	16	29	Away	-13
40	West Ham	28	33	Away	-5

Team 🗘	HFA [‡]
Arsenal	1.7368421
Bournemouth	-0.6315789
Burnley	-0.8421053
Chelsea	2.7368421
Crystal Palace	-0.6842105
Everton	0.9473684
Hull	-2.2631579
Leicester	-0.7894737
Liverpool	1.8947368
Man City	2.1578947
Man United	1.3157895
Middlesbrough	-1.3684211
Southampton	-0.3684211
Stoke	-0.7894737
Sunderland	-2.1052632
Swansea	-1.3157895
Tottenham	3.1578947
Watford	-1.4736842
West Brom	-0.4210526
West Ham	-0.8947368

Season 17-18 Data

¢	Team 🔷	Total_Goals_For $\hat{}$	t_goals_against 🗦	Home $^{\diamond}$	GD [‡]	GDPG [‡]
1	Arsenal	54	20	1	34	1.78947368
2	Arsenal	20	31	Away	-11	-0.57894737
3	Bournemouth	26	30	1	-4	-0.21052632
4	Bournemouth	19	31	Away	-12	-0.63157895
5	Brighton	24	25	1	-1	-0.05263158
6	Brighton	10	29	Away	-19	-1.00000000
7	Burnley	16	17	1	-1	-0.05263158
8	Burnley	20	22	Away	-2	-0.10526316
9	Chelsea	30	16	1	14	0.73684211
10	Chelsea	32	22	Away	10	0.52631579
11	Crystal Palace	29	27	1	2	0.10526316
12	Crystal Palace	16	28	Away	-12	-0.63157895
13	Everton	28	22	1	6	0.31578947
14	Everton	16	36	Away	-20	-1.05263158
15	Huddersfield	16	25	1	-9	-0.47368421
16	Huddersfield	12	33	Away	-21	-1.10526316
17	Leicester	25	22	1	3	0.15789474
18	Leicester	31	38	Away	-7	-0.36842105
19	Liverpool	45	10	1	35	1.84210526
20	Liverpool	39	28	Away	11	0.57894737
21	Man City	61	14	1	47	2.47368421
22	Man City	45	13	Away	32	1.68421053
23	Man United	38	9	1	29	1.52631579
24	Man United	30	19	Away	11	0.57894737
25	Newcastle	21	17	1	4	0.21052632
26	Newcastle	18	30	Away	-12	-0.63157895

27	Southampton	20	26	1	-6	-0.31578947
28	Southampton	17	30	Away	-13	-0.68421053
29	Stoke	20	30	1	-10	-0.52631579
30	Stoke	15	38	Away	-23	-1.21052632
31	Swansea	17	24	1	-7	-0.36842105
32	Swansea	11	32	Away	-21	-1.10526316
33	Tottenham	40	16	1	24	1.26315789
34	Tottenham	34	20	Away	14	0.73684211
35	Watford	27	31	1	-4	-0.21052632
36	Watford	17	33	Away	-16	-0.84210526
37	West Brom	21	29	1	-8	-0.42105263
38	West Brom	10	27	Away	-17	-0.89473684
39	West Ham	24	26	1	-2	-0.10526316
40	West Ham	24	42	Away	-18	-0.94736842

^	Team [‡]	HFA [‡]
1	Arsenal	1.2105263
2	Bournemouth	-0.8421053
3	Brighton	-1.0526316
4	Burnley	-0.1578947
5	Chelsea	1.2631579
6	Crystal Palace	-0.5263158
7	Everton	-0.7368421
8	Huddersfield	-1.5789474
9	Leicester	-0.2105263
10	Liverpool	2.4210526
11	Man City	4.1578947
12	Man United	2.1052632
13	Newcastle	-0.4210526
14	Southampton	-1.0000000
15	Stoke	-1.7368421
16	Swansea	-1.4736842
17	Tottenham	2.000000
18	Watford	-1.0526316
19	West Brom	-1.3157895
20	West Ham	-1.0526316

Season 18-19 Data

4	Team 🔷	Total_Goals_For $\stackrel{\circ}{}$	t_goals_against 🔅	Home \circ	GD ¢
1	Arsenal	42	16	Home	26
2	Arsenal	31	35	Away	-4
3	Bournemouth	30	25	Home	5
4	Bournemouth	26	45	Away	-19
5	Brighton	19	28	Home	-9
6	Brighton	16	32	Away	-16
7	Burnley	24	32	Home	-8
8	Burnley	21	36	Away	-15
9	Cardiff	21	38	Home	-17
10	Cardiff	13	31	Away	-18
11	Chelsea	39	12	Home	27
12	Chelsea	24	27	Away	-3
13	Crystal Palace	19	23	Home	-4
14	Crystal Palace	32	30	Away	2
15	Everton	30	21	Home	9
16	Everton	24	25	Away	-1
17	Fulham	22	36	Home	-14
18	Fulham	12	45	Away	-33
19	Huddersfield	10	31	Home	-21
20	Huddersfield	12	45	Away	-33
21	Leicester	24	20	Home	4
22	Leicester	27	28	Away	-1
23	Liverpool	55	10	Home	45
24	Liverpool	34	12	Away	22
25	Man City	57	12	Home	45
26	Man City	38	11	Away	27
27	Man United	33	25	Home	8
28	Man United	32	29	Away	3
29	Newcastle	24	25	Home	-1
30	Newcastle	18	23	Away	-5
31	Southampton	27	30	Home	-3

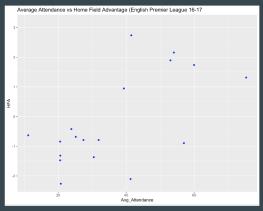
32	Southampton	18	35	Away	-17
33	Tottenham	34	16	Home	18
34	Tottenham	33	23	Away	10
35	Watford	26	28	Home	-2
36	Watford	26	31	Away	-5
37	West Ham	32	27	Home	5
38	West Ham	20	28	Away	-8
39	Wolves	28	21	Home	7
40	Wolves	19	25	Away	-6

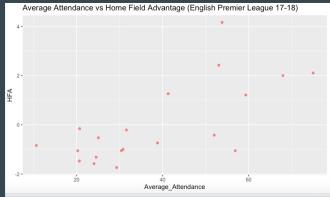
^	Team 🗧	HFA ‡
1	Arsenal	1.15789474
2	Bournemouth	-0.73684211
3	Brighton	-1.31578947
4	Burnley	-1.21052632
5	Cardiff	-1.84210526
6	Chelsea	1.26315789
7	Crystal Palace	-0.10526316
8	Everton	0.42105263
9	Fulham	-2.47368421
10	Huddersfield	-2.84210526
11	Leicester	0.15789474
12	Liverpool	3.52631579
13	Man City	3.78947368
14	Man United	0.57894737
15	Newcastle	-0.31578947
16	Southampton	-1.05263158
17	Tottenham	1.47368421
18	Watford	-0.36842105
19	West Ham	-0.15789474
20	Wolves	0.05263158

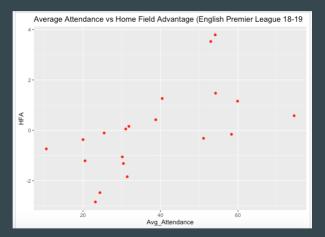
HFA effect of attendance











Conclusion

- Clubs that historically tend to be bigger (have a larger fan-base) have a much better Home Field Advantage
- Clubs that historically tend to be smaller have negative Home Field Advantage

• Higher attendance means better Home Field Advantage