

# Exploratory Data Analysis

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## 1.1: Load data

```
load("../analysis/data/.RData")
#load("../analysis/data/RData.dms")
QBCrossSectional$Week <- as.factor(QBCrossSectional$Week)
attach(QBCrossSectional)
```

```
## The following object is masked from package:ggplot2:
##
##      Position
```

## 1.2: Structures QBCrossSectional and QBPanels

### 1.2.1 QB (Quarterback)

```
head(QBCrossSectional)
```

```
## # A tibble: 6 x 21
##   PlayerID Week Position Opponent TeamIsHome GameDate PassingCompleti~
##   <dbl> <fct> <chr> <chr> <lgl> <date> <dbl>
## 1     6739 13 QB NYJ FALSE 2017-12-03 19
## 2     4314 3 QB HOU TRUE 2017-09-24 25
## 3    13320 10 QB MIA TRUE 2017-11-13 21
## 4    18857 5 QB KC TRUE 2017-10-08 16
## 5    14536 8 QB HOU TRUE 2017-10-29 26
## 6    18857 4 QB TEN TRUE 2017-10-01 25
## # ... with 14 more variables: PassingAttempts <dbl>,
## # PassingCompletionPercentage <dbl>, PassingYards <dbl>,
## # PassingYardsPerAttempt <dbl>, PassingTouchdowns <dbl>,
## # PassingInterceptions <dbl>, PassingRating <dbl>,
## # RushingAttempts <dbl>, RushingYards <dbl>,
## # RushingYardsPerAttempt <dbl>, RushingTouchdowns <dbl>,
## # FumblesLost <dbl>, FantasyPoints <dbl>, Team <chr>
```

```
summary(QBCrossSectional)
```

```
##      PlayerID      Week      Position      Opponent
## Min.   : 611    2      : 30 Length:453      Length:453
## 1st Qu.: 7242   13      : 29 Class :character Class :character
## Median :13723   14      : 29 Mode  :character Mode  :character
## Mean   :11932   3       : 28
## 3rd Qu.:16763   4       : 28
## Max.   :19029   12      : 28
##      (Other):281
## TeamIsHome      GameDate      PassingCompletions PassingAttempts
## Mode :logical   Min.   :2017-09-07 Min.   : 5.00    Min.   :10.00
## FALSE:226      1st Qu.:2017-10-08 1st Qu.:18.00    1st Qu.:29.00
## TRUE :227      Median :2017-11-05 Median :21.00    Median :33.00
```

```
##           Mean   :2017-11-05   Mean   :21.24   Mean   :33.62
##           3rd Qu.:2017-12-03   3rd Qu.:25.00   3rd Qu.:38.00
##           Max.   :2017-12-31   Max.   :44.00   Max.   :66.00
##
## PassingCompletionPercentage PassingYards PassingYardsPerAttempt
## Min.   :38.70           Min.   : 57.0   Min.   : 3.100
## 1st Qu.:57.10           1st Qu.:199.0   1st Qu.: 6.200
## Median :63.20           Median :241.0   Median : 7.200
## Mean   :63.48           Mean   :244.6   Mean   : 7.378
## 3rd Qu.:69.40           3rd Qu.:291.0   3rd Qu.: 8.400
## Max.   :87.00           Max.   :506.0   Max.   :14.100
##
## PassingTouchdowns PassingInterceptions PassingRating RushingAttempts
## Min.   :0.000   Min.   :0.00   Min.   : 31.14   Min.   : 0.000
## 1st Qu.:1.000   1st Qu.:0.00   1st Qu.: 77.92   1st Qu.: 1.000
## Median :1.000   Median :0.00   Median : 92.94   Median : 3.000
## Mean   :1.587   Mean   :0.66   Mean   : 93.88   Mean   : 3.185
## 3rd Qu.:2.000   3rd Qu.:1.00   3rd Qu.:109.84   3rd Qu.: 5.000
## Max.   :5.000   Max.   :4.00   Max.   :150.69   Max.   :14.000
##
## RushingYards RushingYardsPerAttempt RushingTouchdowns FumblesLost
## Min.   : -8.00   Min.   : -2.700   Min.   :0.0000   Min.   :0.0000
## 1st Qu.: 0.00   1st Qu.: 0.000   1st Qu.:0.0000   1st Qu.:0.0000
## Median : 8.00   Median : 3.000   Median :0.0000   Median :0.0000
## Mean   :14.38   Mean   : 3.839   Mean   :0.1457   Mean   :0.1766
## 3rd Qu.:23.00   3rd Qu.: 6.000   3rd Qu.:0.0000   3rd Qu.:0.0000
## Max.   :95.00   Max.   :70.000   Max.   :2.0000   Max.   :3.0000
##
## FantasyPoints      Team
## Min.   : 7.12   Length:453
## 1st Qu.:11.86   Class :character
## Median :15.86   Mode  :character
## Mean   :16.89
## 3rd Qu.:20.68
## Max.   :37.64
##
```

## 1.2.2 QB (Panel Data)

```
str(QBPanels)
```

```
## List of 17
## $ Opponent           :Classes 'tbl_df', 'tbl' and 'data.frame': 56 obs. of  18 variables:
## ..$ PlayerID: num [1:56] 611 732 2428 2593 3807 ...
## ..$ 1       : chr [1:56] NA "CHI" "DET" "SEA" ...
## ..$ 2       : chr [1:56] "CLE" "GB" "IND" "ATL" ...
## ..$ 3       : chr [1:56] NA "DET" "DAL" "CIN" ...
## ..$ 4       : chr [1:56] "PIT" "BUF" "SF" "CHI" ...
## ..$ 5       : chr [1:56] "OAK" NA "PHI" "DAL" ...
## ..$ 6       : chr [1:56] NA "MIA" "TB" NA ...
## ..$ 7       : chr [1:56] "MIN" "NE" NA NA ...
## ..$ 8       : chr [1:56] "MIA" "NYJ" NA NA ...
## ..$ 9       : chr [1:56] "TEN" "CAR" NA NA ...
## ..$ 10      : chr [1:56] NA "DAL" NA NA ...
```

```

## ..$ 11      : chr [1:56] "GB" "SEA" NA NA ...
## ..$ 12      : chr [1:56] "HOU" "TB" NA NA ...
## ..$ 13      : chr [1:56] "DET" NA NA NA ...
## ..$ 14      : chr [1:56] "PIT" NA NA NA ...
## ..$ 15      : chr [1:56] "CLE" "TB" NA "CAR" ...
## ..$ 16      : chr [1:56] "IND" "NO" NA NA ...
## ..$ 17      : chr [1:56] "CIN" "CAR" NA NA ...
## $ TeamIsHome      :Classes 'tbl_df', 'tbl' and 'data.frame': 56 obs. of  18 variables:
## ..$ PlayerID: num [1:56] 611 732 2428 2593 3807 ...
## ..$ 1      : logi [1:56] NA FALSE FALSE TRUE FALSE TRUE ...
## ..$ 2      : logi [1:56] TRUE TRUE FALSE FALSE TRUE FALSE ...
## ..$ 3      : logi [1:56] NA FALSE TRUE TRUE FALSE TRUE ...
## ..$ 4      : logi [1:56] TRUE TRUE TRUE TRUE FALSE TRUE ...
## ..$ 5      : logi [1:56] FALSE NA FALSE FALSE NA FALSE ...
## ..$ 6      : logi [1:56] NA TRUE TRUE NA FALSE FALSE ...
## ..$ 7      : logi [1:56] FALSE FALSE NA NA TRUE TRUE ...
## ..$ 8      : logi [1:56] TRUE FALSE NA NA FALSE TRUE ...
## ..$ 9      : logi [1:56] FALSE FALSE NA NA NA NA ...
## ..$ 10     : logi [1:56] NA TRUE NA NA FALSE FALSE ...
## ..$ 11     : logi [1:56] FALSE FALSE NA NA TRUE FALSE ...
## ..$ 12     : logi [1:56] TRUE TRUE NA NA TRUE TRUE ...
## ..$ 13     : logi [1:56] TRUE NA NA NA FALSE FALSE ...
## ..$ 14     : logi [1:56] FALSE NA NA NA TRUE FALSE ...
## ..$ 15     : logi [1:56] FALSE FALSE NA FALSE TRUE FALSE ...
## ..$ 16     : logi [1:56] TRUE FALSE NA NA FALSE TRUE ...
## ..$ 17     : logi [1:56] TRUE TRUE NA NA NA TRUE ...
## $ PassingCompletions :Classes 'tbl_df', 'tbl' and 'data.frame': 56 obs. of  18 variables:
## ..$ PlayerID: num [1:56] 611 732 2428 2593 3807 ...
## ..$ 1      : num [1:56] NA 21 27 28 24 16 NA NA 26 NA ...
## ..$ 2      : num [1:56] 25 19 19 33 23 30 NA 22 16 NA ...
## ..$ 3      : num [1:56] NA 24 29 28 22 25 NA 35 18 NA ...
## ..$ 4      : num [1:56] 31 24 33 18 18 32 NA 30 NA NA ...
## ..$ 5      : num [1:56] 19 NA 28 19 NA 30 NA 21 23 NA ...
## ..$ 6      : num [1:56] NA 24 18 NA 17 20 NA 11 31 NA ...
## ..$ 7      : num [1:56] 27 23 NA NA 14 21 NA 19 17 13 ...
## ..$ 8      : num [1:56] 10 18 NA NA 17 32 NA NA 26 NA ...
## ..$ 9      : num [1:56] 34 24 NA NA NA NA 15 20 14 NA ...
## ..$ 10     : num [1:56] NA 22 NA NA 19 25 24 28 23 NA ...
## ..$ 11     : num [1:56] 22 19 NA NA 30 30 NA 19 NA 17 ...
## ..$ 12     : num [1:56] 20 26 NA NA 33 18 NA NA 19 23 ...
## ..$ 13     : num [1:56] 23 NA NA NA 24 21 NA NA 26 NA ...
## ..$ 14     : num [1:56] 20 NA NA NA 44 24 NA 31 NA NA ...
## ..$ 15     : num [1:56] 26 17 NA 26 22 22 NA 37 NA NA ...
## ..$ 16     : num [1:56] 29 22 NA NA 20 21 20 NA NA NA ...
## ..$ 17     : num [1:56] 25 28 NA NA NA 18 15 NA NA NA ...
## $ PassingAttempts   :Classes 'tbl_df', 'tbl' and 'data.frame': 56 obs. of  18 variables:
## ..$ PlayerID: num [1:56] 611 732 2428 2593 3807 ...
## ..$ 1      : num [1:56] NA 30 48 42 36 36 NA NA 39 NA ...
## ..$ 2      : num [1:56] 34 28 36 50 35 39 NA 32 24 NA ...
## ..$ 3      : num [1:56] NA 35 48 42 39 35 NA 47 23 NA ...
## ..$ 4      : num [1:56] 49 42 51 26 30 45 NA 49 NA NA ...
## ..$ 5      : num [1:56] 26 NA 44 29 NA 40 NA 36 30 NA ...
## ..$ 6      : num [1:56] NA 35 22 NA 25 38 NA 19 47 NA ...
## ..$ 7      : num [1:56] 39 33 NA NA 24 29 NA 39 27 21 ...

```

```

## ..$ 8      : num [1:56] 15 29 NA NA 31 47 NA NA 33 NA ...
## ..$ 9      : num [1:56] 52 38 NA NA NA NA 30 36 20 NA ...
## ..$ 10     : num [1:56] NA 29 NA NA 31 34 47 37 39 NA ...
## ..$ 11     : num [1:56] 28 27 NA NA 45 37 NA 35 NA 28 ...
## ..$ 12     : num [1:56] 32 35 NA NA 45 28 NA NA 36 34 ...
## ..$ 13     : num [1:56] 36 NA NA NA 40 30 NA NA 36 NA ...
## ..$ 14     : num [1:56] 35 NA NA NA 66 43 NA 46 NA NA ...
## ..$ 15     : num [1:56] 42 31 NA 45 30 35 NA 57 NA NA ...
## ..$ 16     : num [1:56] 38 36 NA NA 29 28 34 NA NA NA ...
## ..$ 17     : num [1:56] 47 45 NA NA NA 37 34 NA NA NA ...
## $ PassingCompletionPercentage:Classes 'tbl_df', 'tbl' and 'data.frame': 56 obs. of  18 variables:
## ..$ PlayerID: num [1:56] 611 732 2428 2593 3807 ...
## ..$ 1      : num [1:56] NA 70 56.2 66.7 66.7 44.4 NA NA 66.7 NA ...
## ..$ 2      : num [1:56] 73.5 67.9 52.8 66 65.7 76.9 NA 68.8 66.7 NA ...
## ..$ 3      : num [1:56] NA 68.6 60.4 66.7 56.4 71.4 NA 74.5 78.3 NA ...
## ..$ 4      : num [1:56] 63.3 57.1 64.7 69.2 60 71.1 NA 61.2 NA NA ...
## ..$ 5      : num [1:56] 73.1 NA 63.6 65.5 NA 75 NA 58.3 76.7 NA ...
## ..$ 6      : num [1:56] NA 68.6 81.8 NA 68 52.6 NA 57.9 66 NA ...
## ..$ 7      : num [1:56] 69.2 69.7 NA NA 58.3 72.4 NA 48.7 63 61.9 ...
## ..$ 8      : num [1:56] 66.7 62.1 NA NA 54.8 68.1 NA NA 78.8 NA ...
## ..$ 9      : num [1:56] 65.4 63.2 NA NA NA NA 50 55.6 70 NA ...
## ..$ 10     : num [1:56] NA 75.9 NA NA 61.3 73.5 51.1 75.7 59 NA ...
## ..$ 11     : num [1:56] 78.6 70.4 NA NA 66.7 81.1 NA 54.3 NA 60.7 ...
## ..$ 12     : num [1:56] 62.5 74.3 NA NA 73.3 64.3 NA NA 52.8 67.6 ...
## ..$ 13     : num [1:56] 63.9 NA NA NA 60 70 NA NA 72.2 NA ...
## ..$ 14     : num [1:56] 57.1 NA NA NA 66.7 55.8 NA 67.4 NA NA ...
## ..$ 15     : num [1:56] 61.9 54.8 NA 57.8 73.3 62.9 NA 64.9 NA NA ...
## ..$ 16     : num [1:56] 76.3 61.1 NA NA 69 75 58.8 NA NA NA ...
## ..$ 17     : num [1:56] 53.2 62.2 NA NA NA 48.6 44.1 NA NA NA ...
## $ PassingYards      :Classes 'tbl_df', 'tbl' and 'data.frame': 56 obs. of  18 variables:
## ..$ PlayerID: num [1:56] 611 732 2428 2593 3807 ...
## ..$ 1      : num [1:56] NA 321 268 311 263 267 NA NA 187 NA ...
## ..$ 2      : num [1:56] 217 252 332 343 243 447 NA 239 166 NA ...
## ..$ 3      : num [1:56] NA 294 325 313 235 378 NA 366 249 NA ...
## ..$ 4      : num [1:56] 235 242 357 179 216 307 NA 288 NA NA ...
## ..$ 5      : num [1:56] 222 NA 291 221 NA 303 NA 225 194 NA ...
## ..$ 6      : num [1:56] NA 248 283 NA 252 257 NA 128 354 NA ...
## ..$ 7      : num [1:56] 186 233 NA NA 224 249 NA 134 209 188 ...
## ..$ 8      : num [1:56] 101 254 NA NA 317 333 NA NA 257 NA ...
## ..$ 9      : num [1:56] 261 313 NA NA NA NA 201 220 140 NA ...
## ..$ 10     : num [1:56] NA 215 NA NA 236 266 273 273 262 NA ...
## ..$ 11     : num [1:56] 183 195 NA NA 299 340 NA 205 NA 282 ...
## ..$ 12     : num [1:56] 141 317 NA NA 351 227 NA NA 307 215 ...
## ..$ 13     : num [1:56] 269 NA NA NA 290 258 NA NA 331 NA ...
## ..$ 14     : num [1:56] 269 NA NA NA 506 233 NA 228 NA NA ...
## ..$ 15     : num [1:56] 288 212 NA 290 281 298 NA 434 NA NA ...
## ..$ 16     : num [1:56] 237 288 NA NA 226 224 209 NA NA NA ...
## ..$ 17     : num [1:56] 203 317 NA NA NA 190 145 NA NA NA ...
## $ PassingYardsPerAttempt :Classes 'tbl_df', 'tbl' and 'data.frame': 56 obs. of  18 variables:
## ..$ PlayerID: num [1:56] 611 732 2428 2593 3807 ...
## ..$ 1      : num [1:56] NA 10.7 5.6 7.4 7.3 7.4 NA NA 4.8 NA ...
## ..$ 2      : num [1:56] 6.4 9 9.2 6.9 6.9 11.5 NA 7.5 6.9 NA ...
## ..$ 3      : num [1:56] NA 8.4 6.8 7.5 6 10.8 NA 7.8 10.8 NA ...
## ..$ 4      : num [1:56] 4.8 5.8 7 6.9 7.2 6.8 NA 5.9 NA NA ...

```

```

## ..$ 5      : num [1:56] 8.5 NA 6.6 7.6 NA 7.6 NA 6.2 6.5 NA ...
## ..$ 6      : num [1:56] NA 7.1 12.9 NA 10.1 6.8 NA 6.7 7.5 NA ...
## ..$ 7      : num [1:56] 4.8 7.1 NA NA 9.3 8.6 NA 3.4 7.7 9 ...
## ..$ 8      : num [1:56] 6.7 8.8 NA NA 10.2 7.1 NA NA 7.8 NA ...
## ..$ 9      : num [1:56] 5 8.2 NA NA NA NA 6.7 6.1 7 NA ...
## ..$ 10     : num [1:56] NA 7.4 NA NA 7.6 7.8 5.8 7.4 6.7 NA ...
## ..$ 11     : num [1:56] 6.5 7.2 NA NA 6.6 9.2 NA 5.9 NA 10.1 ...
## ..$ 12     : num [1:56] 4.4 9.1 NA NA 7.8 8.1 NA NA 8.5 6.3 ...
## ..$ 13     : num [1:56] 7.5 NA NA NA 7.2 8.6 NA NA 9.2 NA ...
## ..$ 14     : num [1:56] 7.7 NA NA NA 7.7 5.4 NA 5 NA NA ...
## ..$ 15     : num [1:56] 6.9 6.8 NA 6.4 9.4 8.5 NA 7.6 NA NA ...
## ..$ 16     : num [1:56] 6.2 8 NA NA 7.8 8 6.1 NA NA NA ...
## ..$ 17     : num [1:56] 4.3 7 NA NA NA 5.1 4.3 NA NA NA ...
## $ PassingTouchdowns      :Classes 'tbl_df', 'tbl' and 'data.frame': 56 obs. of  18 variables:
## ..$ PlayerID: num [1:56] 611 732 2428 2593 3807 ...
## ..$ 1        : num [1:56] NA 1 1 1 2 0 NA NA 0 NA ...
## ..$ 2        : num [1:56] 2 1 1 2 2 3 NA 1 2 NA ...
## ..$ 3        : num [1:56] NA 2 2 3 1 5 NA 3 1 NA ...
## ..$ 4        : num [1:56] 1 1 1 4 1 2 NA 2 NA NA ...
## ..$ 5        : num [1:56] 0 NA 1 3 NA 1 NA 2 2 NA ...
## ..$ 6        : num [1:56] NA 1 3 NA 1 2 NA 1 2 NA ...
## ..$ 7        : num [1:56] 1 1 NA NA 2 2 NA 1 3 2 ...
## ..$ 8        : num [1:56] 1 2 NA NA 1 1 NA NA 2 NA ...
## ..$ 9        : num [1:56] 2 2 NA NA NA NA 2 2 1 NA ...
## ..$ 10       : num [1:56] NA 2 NA NA 2 3 1 2 1 NA ...
## ..$ 11       : num [1:56] 1 2 NA NA 4 3 NA 0 NA 1 ...
## ..$ 12       : num [1:56] 0 1 NA NA 4 4 NA NA 3 1 ...
## ..$ 13       : num [1:56] 2 NA NA NA 2 0 NA NA 1 NA ...
## ..$ 14       : num [1:56] 2 NA NA NA 2 1 NA 1 NA NA ...
## ..$ 15       : num [1:56] 1 1 NA 3 2 1 NA 3 NA NA ...
## ..$ 16       : num [1:56] 2 1 NA NA 2 2 2 NA NA NA ...
## ..$ 17       : num [1:56] 2 1 NA NA NA 2 1 NA NA NA ...
## $ PassingInterceptions    :Classes 'tbl_df', 'tbl' and 'data.frame': 56 obs. of  18 variables:
## ..$ PlayerID: num [1:56] 611 732 2428 2593 3807 ...
## ..$ 1        : num [1:56] NA 0 3 1 1 0 NA NA 2 NA ...
## ..$ 2        : num [1:56] 1 0 1 1 0 0 NA 1 0 NA ...
## ..$ 3        : num [1:56] NA 3 0 1 0 0 NA 2 0 NA ...
## ..$ 4        : num [1:56] 2 2 1 0 1 0 NA 0 NA NA ...
## ..$ 5        : num [1:56] 0 NA 0 0 NA 1 NA 1 1 NA ...
## ..$ 6        : num [1:56] NA 1 1 NA 1 1 NA 0 2 NA ...
## ..$ 7        : num [1:56] 0 0 NA NA 0 0 NA 0 1 1 ...
## ..$ 8        : num [1:56] 0 0 NA NA 1 0 NA NA 0 NA ...
## ..$ 9        : num [1:56] 2 1 NA NA NA NA 1 1 0 NA ...
## ..$ 10       : num [1:56] NA 1 NA NA 1 0 0 0 1 NA ...
## ..$ 11       : num [1:56] 1 0 NA NA 0 0 NA 0 NA 0 ...
## ..$ 12       : num [1:56] 0 0 NA NA 2 1 NA NA 0 2 ...
## ..$ 13       : num [1:56] 0 NA NA NA 1 1 NA NA 0 NA ...
## ..$ 14       : num [1:56] 1 NA NA NA 0 2 NA 2 NA NA ...
## ..$ 15       : num [1:56] 0 0 NA 3 1 1 NA 1 NA NA ...
## ..$ 16       : num [1:56] 0 1 NA NA 0 1 2 NA NA NA ...
## ..$ 17       : num [1:56] 1 0 NA NA NA 0 1 NA NA NA ...
## $ PassingRating           :Classes 'tbl_df', 'tbl' and 'data.frame': 56 obs. of  18 variables:
## ..$ PlayerID: num [1:56] 611 732 2428 2593 3807 ...
## ..$ 1        : num [1:56] NA 116.1 53.1 86.5 95 ...

```

```

## ..$ 2      : num [1:56] 97.3 108 82.2 90.7 104.8 ...
## ..$ 3      : num [1:56] NA 77.6 94.5 102.6 82.8 ...
## ..$ 4      : num [1:56] 64.6 61.8 83.5 128 79.3 ...
## ..$ 5      : num [1:56] 98.6 NA 90.2 122.9 NA ...
## ..$ 6      : num [1:56] NA 86.4 139.4 NA 97.4 ...
## ..$ 7      : num [1:56] 88.2 99.7 NA NA 117.4 ...
## ..$ 8      : num [1:56] 107.9 113.3 NA NA 87.7 ...
## ..$ 9      : num [1:56] 74.3 95.6 NA NA NA ...
## ..$ 10     : num [1:56] NA 104.8 NA NA 92.9 ...
## ..$ 11     : num [1:56] 90.9 115.5 NA NA 115 ...
## ..$ 12     : num [1:56] 72.5 111.2 NA NA 106.8 ...
## ..$ 13     : num [1:56] 105 NA NA NA 88.5 ...
## ..$ 14     : num [1:56] 88.9 NA NA NA 99.7 ...
## ..$ 15     : num [1:56] 90.2 87 NA 71.5 110.6 ...
## ..$ 16     : num [1:56] 109 84 NA NA 115 ...
## ..$ 17     : num [1:56] 69.7 90.7 NA NA NA ...
## $ RushingAttempts      :Classes 'tbl_df', 'tbl' and 'data.frame': 56 obs. of  18 variables:
## ..$ PlayerID: num [1:56] 611 732 2428 2593 3807 ...
## ..$ 1      : num [1:56] NA 3 1 7 3 2 NA NA 2 NA ...
## ..$ 2      : num [1:56] 1 1 3 2 2 2 NA 0 4 NA ...
## ..$ 3      : num [1:56] NA 1 3 4 1 1 NA 0 4 NA ...
## ..$ 4      : num [1:56] 0 1 2 1 1 1 NA 3 NA NA ...
## ..$ 5      : num [1:56] 3 NA 0 4 NA 2 NA 0 3 NA ...
## ..$ 6      : num [1:56] NA 0 5 NA 2 1 NA 1 3 NA ...
## ..$ 7      : num [1:56] 1 3 NA NA 3 5 NA 0 3 0 ...
## ..$ 8      : num [1:56] 1 6 NA NA 3 1 NA NA 1 NA ...
## ..$ 9      : num [1:56] 1 1 NA NA NA NA 4 0 5 NA ...
## ..$ 10     : num [1:56] NA 0 NA NA 2 1 1 0 0 NA ...
## ..$ 11     : num [1:56] 2 3 NA NA 1 0 NA 2 NA 1 ...
## ..$ 12     : num [1:56] 6 1 NA NA 3 5 NA NA 2 2 ...
## ..$ 13     : num [1:56] 1 NA NA NA 1 0 NA NA 7 NA ...
## ..$ 14     : num [1:56] 0 NA NA NA 1 0 NA 0 NA NA ...
## ..$ 15     : num [1:56] 4 3 NA 6 3 2 NA 0 NA NA ...
## ..$ 16     : num [1:56] 4 2 NA NA 1 2 2 NA NA NA ...
## ..$ 17     : num [1:56] 0 3 NA NA NA 0 1 NA NA NA ...
## $ RushingYards      :Classes 'tbl_df', 'tbl' and 'data.frame': 56 obs. of  18 variables:
## ..$ PlayerID: num [1:56] 611 732 2428 2593 3807 ...
## ..$ 1      : num [1:56] NA 11 2 21 -8 0 NA NA 0 NA ...
## ..$ 2      : num [1:56] -1 8 6 8 -2 9 NA 0 31 NA ...
## ..$ 3      : num [1:56] NA -1 7 23 6 6 NA 0 7 NA ...
## ..$ 4      : num [1:56] 0 8 1 -1 -1 2 NA 22 NA NA ...
## ..$ 5      : num [1:56] -4 NA 0 32 NA 5 NA 0 -3 NA ...
## ..$ 6      : num [1:56] NA 0 -4 NA -2 -1 NA 0 21 NA ...
## ..$ 7      : num [1:56] 0 37 NA NA -3 5 NA 0 1 0 ...
## ..$ 8      : num [1:56] 9 17 NA NA -2 2 NA NA 0 NA ...
## ..$ 9      : num [1:56] 7 -1 NA NA NA NA 2 0 13 NA ...
## ..$ 10     : num [1:56] NA 0 NA NA 5 0 1 0 0 NA ...
## ..$ 11     : num [1:56] -1 12 NA NA 10 0 NA 5 NA 0 ...
## ..$ 12     : num [1:56] 42 1 NA NA 25 -4 NA NA 28 9 ...
## ..$ 13     : num [1:56] -1 NA NA NA 4 0 NA NA 19 NA ...
## ..$ 14     : num [1:56] 0 NA NA NA 5 0 NA 0 NA NA ...
## ..$ 15     : num [1:56] 3 29 NA 43 10 -2 NA 0 NA NA ...
## ..$ 16     : num [1:56] -2 7 NA NA -1 6 1 NA NA NA ...
## ..$ 17     : num [1:56] 0 14 NA NA NA 0 -1 NA NA NA ...

```

```

## $ RushingYardsPerAttempt      :Classes 'tbl_df', 'tbl' and 'data.frame': 56 obs. of  18 variables:
## ..$ PlayerID: num [1:56] 611 732 2428 2593 3807 ...
## ..$ 1       : num [1:56] NA 3.7 2 3 -2.7 0 NA NA 0 NA ...
## ..$ 2       : num [1:56] -1 8 2 4 -1 4.5 NA 0 7.8 NA ...
## ..$ 3       : num [1:56] NA -1 2.3 5.8 6 6 NA 0 1.8 NA ...
## ..$ 4       : num [1:56] 0 8 0.5 -1 -1 2 NA 7.3 NA NA ...
## ..$ 5       : num [1:56] -1.3 NA 0 8 NA 2.5 NA 0 -1 NA ...
## ..$ 6       : num [1:56] NA 0 -0.8 NA -1 -1 NA 0 7 NA ...
## ..$ 7       : num [1:56] 0 12.3 NA NA -1 1 NA 0 0.3 0 ...
## ..$ 8       : num [1:56] 9 2.8 NA NA -0.7 2 NA NA 0 NA ...
## ..$ 9       : num [1:56] 7 -1 NA NA NA NA 0.5 0 2.6 NA ...
## ..$ 10      : num [1:56] NA 0 NA NA 2.5 0 1 0 0 NA ...
## ..$ 11      : num [1:56] -0.5 4 NA NA 10 0 NA 2.5 NA 0 ...
## ..$ 12      : num [1:56] 7 1 NA NA 8.3 -0.8 NA NA 14 4.5 ...
## ..$ 13      : num [1:56] -1 NA NA NA 4 0 NA NA 2.7 NA ...
## ..$ 14      : num [1:56] 0 NA NA NA 5 0 NA 0 NA NA ...
## ..$ 15      : num [1:56] 0.8 9.7 NA 7.2 3.3 -1 NA 0 NA NA ...
## ..$ 16      : num [1:56] -0.5 3.5 NA NA -1 3 0.5 NA NA NA ...
## ..$ 17      : num [1:56] 0 4.7 NA NA NA 0 -1 NA NA NA ...
## $ RushingTouchdowns          :Classes 'tbl_df', 'tbl' and 'data.frame': 56 obs. of  18 variables:
## ..$ PlayerID: num [1:56] 611 732 2428 2593 3807 ...
## ..$ 1       : num [1:56] NA 0 0 0 0 0 NA NA 1 NA ...
## ..$ 2       : num [1:56] 0 0 0 0 0 0 NA 0 0 NA ...
## ..$ 3       : num [1:56] NA 0 0 0 0 0 NA 0 0 NA ...
## ..$ 4       : num [1:56] 0 0 0 0 0 0 NA 1 NA NA ...
## ..$ 5       : num [1:56] 0 NA 0 0 NA 0 NA 0 0 NA ...
## ..$ 6       : num [1:56] NA 0 0 NA 0 0 NA 0 0 NA ...
## ..$ 7       : num [1:56] 0 0 NA NA 0 0 NA 0 1 0 ...
## ..$ 8       : num [1:56] 0 0 NA NA 0 0 NA NA 0 NA ...
## ..$ 9       : num [1:56] 0 0 NA NA NA NA 0 0 1 NA ...
## ..$ 10      : num [1:56] NA 0 NA NA 0 0 0 0 0 NA ...
## ..$ 11      : num [1:56] 0 0 NA NA 0 0 NA 0 NA 0 ...
## ..$ 12      : num [1:56] 0 0 NA NA 0 0 NA NA 0 0 ...
## ..$ 13      : num [1:56] 0 NA NA NA 0 0 NA NA 2 NA ...
## ..$ 14      : num [1:56] 0 NA NA NA 0 0 NA 0 NA NA ...
## ..$ 15      : num [1:56] 1 0 NA 0 0 0 NA 0 NA NA ...
## ..$ 16      : num [1:56] 0 0 NA NA 0 0 0 NA NA NA ...
## ..$ 17      : num [1:56] 0 0 NA NA NA 0 0 NA NA NA ...
## $ FumblesLost                 :Classes 'tbl_df', 'tbl' and 'data.frame': 56 obs. of  18 variables:
## ..$ PlayerID: num [1:56] 611 732 2428 2593 3807 ...
## ..$ 1       : num [1:56] NA 0 0 0 0 0 NA NA 0 NA ...
## ..$ 2       : num [1:56] 0 0 0 1 0 0 NA 0 1 NA ...
## ..$ 3       : num [1:56] NA 0 0 0 1 1 NA 0 0 NA ...
## ..$ 4       : num [1:56] 0 1 0 0 0 0 NA 0 NA NA ...
## ..$ 5       : num [1:56] 0 NA 0 0 NA 1 NA 1 0 NA ...
## ..$ 6       : num [1:56] NA 0 0 NA 0 0 NA 0 0 NA ...
## ..$ 7       : num [1:56] 0 0 NA NA 0 0 NA 1 0 0 ...
## ..$ 8       : num [1:56] 0 2 NA NA 0 0 NA NA 0 NA ...
## ..$ 9       : num [1:56] 0 0 NA NA NA NA 0 1 0 NA ...
## ..$ 10      : num [1:56] NA 0 NA NA 0 0 0 1 0 NA ...
## ..$ 11      : num [1:56] 0 0 NA NA 0 0 NA 0 NA 0 ...
## ..$ 12      : num [1:56] 0 0 NA NA 0 1 NA NA 1 0 ...
## ..$ 13      : num [1:56] 0 NA NA NA 0 0 NA NA 0 NA ...
## ..$ 14      : num [1:56] 0 NA NA NA 0 0 NA 0 NA NA ...

```

```

## ..$ 15      : num [1:56] 0 0 NA 0 0 0 NA 0 NA NA ...
## ..$ 16      : num [1:56] 0 0 NA NA 0 0 0 NA NA NA ...
## ..$ 17      : num [1:56] 0 0 NA NA NA 0 0 NA NA NA ...
## $ FantasyPoints      :Classes 'tbl_df', 'tbl' and 'data.frame': 56 obs. of  18 variables:
## ..$ PlayerID: num [1:56] 611 732 2428 2593 3807 ...
## ..$ 1       : num [1:56] NA 17.94 8.92 16.54 15.72 ...
## ..$ 2       : num [1:56] 14.6 14.9 15.9 18.5 17.5 ...
## ..$ 3       : num [1:56] NA 13.7 21.7 24.8 12 ...
## ..$ 4       : num [1:56] 9.4 8.48 16.38 23.06 10.54 ...
## ..$ 5       : num [1:56] 8.48 NA 15.64 24.04 NA ...
## ..$ 6       : num [1:56] NA 11.9 20.9 NA 11.9 ...
## ..$ 7       : num [1:56] 11.4 17 NA NA 16.7 ...
## ..$ 8       : num [1:56] 8.94 15.86 NA NA 14.48 ...
## ..$ 9       : num [1:56] 15.1 18.4 NA NA NA ...
## ..$ 10      : num [1:56] NA 14.6 NA NA 17.9 ...
## ..$ 11      : num [1:56] 9.22 17 NA NA 28.96 ...
## ..$ 12      : num [1:56] 9.84 16.78 NA NA 30.54 ...
## ..$ 13      : num [1:56] 18.7 NA NA NA 18 ...
## ..$ 14      : num [1:56] 16.8 NA NA NA 28.7 ...
## ..$ 15      : num [1:56] 21.8 15.4 NA 21.9 18.2 ...
## ..$ 16      : num [1:56] 17.3 14.2 NA NA 16.9 ...
## ..$ 17      : num [1:56] 14.1 18.1 NA NA NA ...
## $ Team      :Classes 'tbl_df', 'tbl' and 'data.frame': 56 obs. of  18 variables:
## ..$ PlayerID: num [1:56] 611 732 2428 2593 3807 ...
## ..$ 1       : chr [1:56] NA "ATL" "ARI" "GB" ...
## ..$ 2       : chr [1:56] "BAL" "ATL" "ARI" "GB" ...
## ..$ 3       : chr [1:56] NA "ATL" "ARI" "GB" ...
## ..$ 4       : chr [1:56] "BAL" "ATL" "ARI" "GB" ...
## ..$ 5       : chr [1:56] "BAL" NA "ARI" "GB" ...
## ..$ 6       : chr [1:56] NA "ATL" "ARI" NA ...
## ..$ 7       : chr [1:56] "BAL" "ATL" NA NA ...
## ..$ 8       : chr [1:56] "BAL" "ATL" NA NA ...
## ..$ 9       : chr [1:56] "BAL" "ATL" NA NA ...
## ..$ 10      : chr [1:56] NA "ATL" NA NA ...
## ..$ 11      : chr [1:56] "BAL" "ATL" NA NA ...
## ..$ 12      : chr [1:56] "BAL" "ATL" NA NA ...
## ..$ 13      : chr [1:56] "BAL" NA NA NA ...
## ..$ 14      : chr [1:56] "BAL" NA NA NA ...
## ..$ 15      : chr [1:56] "BAL" "ATL" NA "GB" ...
## ..$ 16      : chr [1:56] "BAL" "ATL" NA NA ...
## ..$ 17      : chr [1:56] "BAL" "ATL" NA NA ...

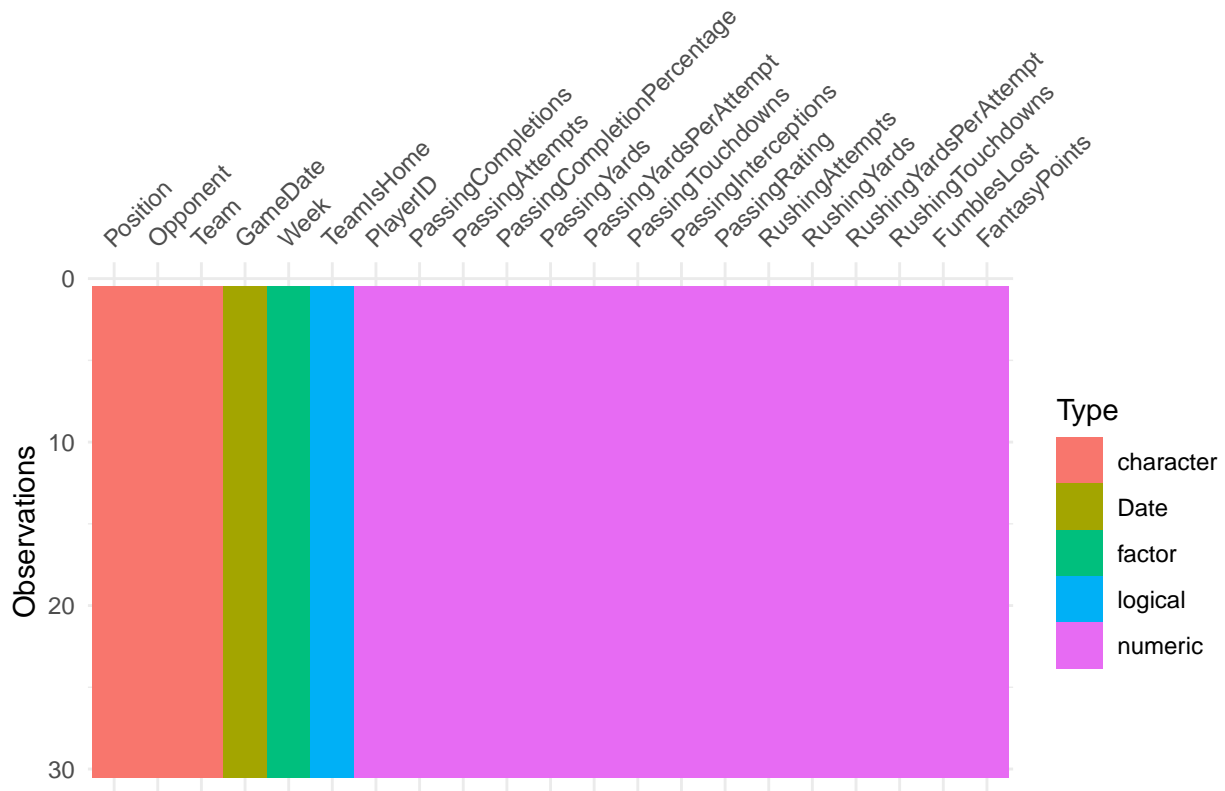
```

## 1.3: Missing Data

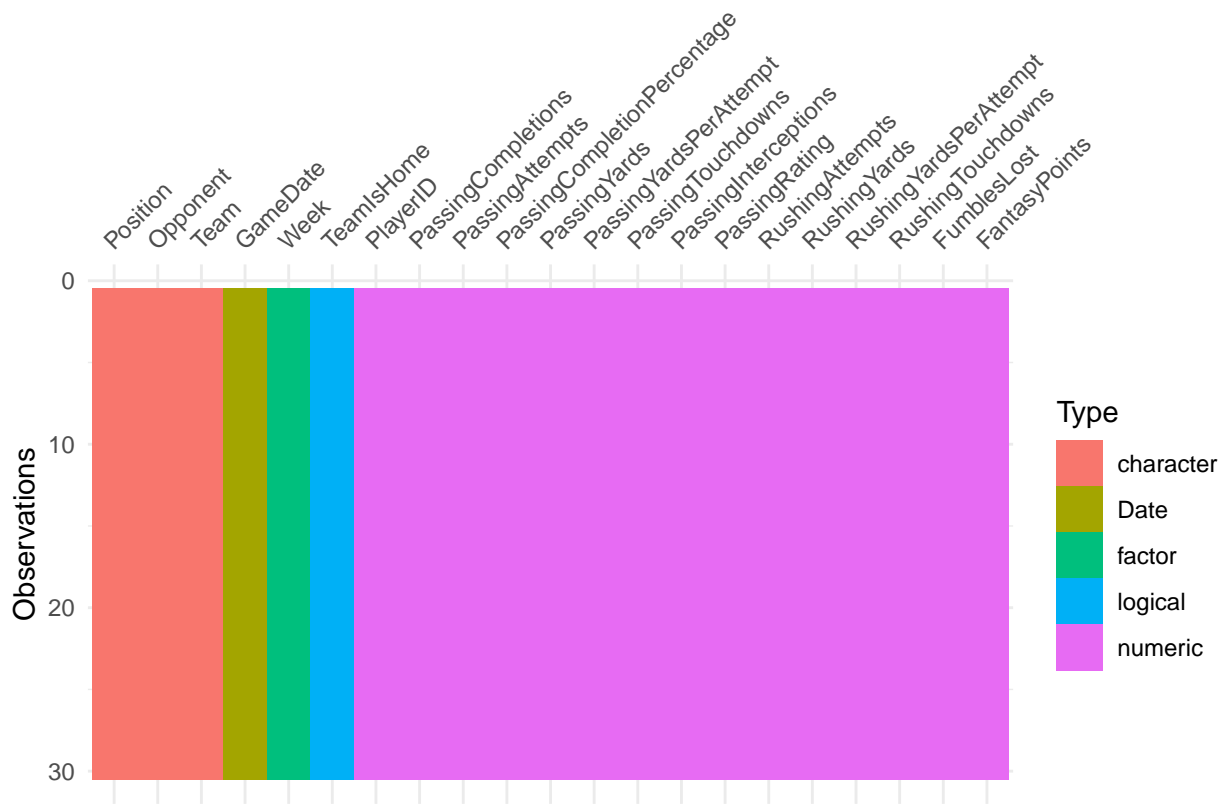
### 1.3.1 Quarterbacks (Old Data QBdata dataset)

```
vis_dat(QBCrossSectional[1:30,])
```

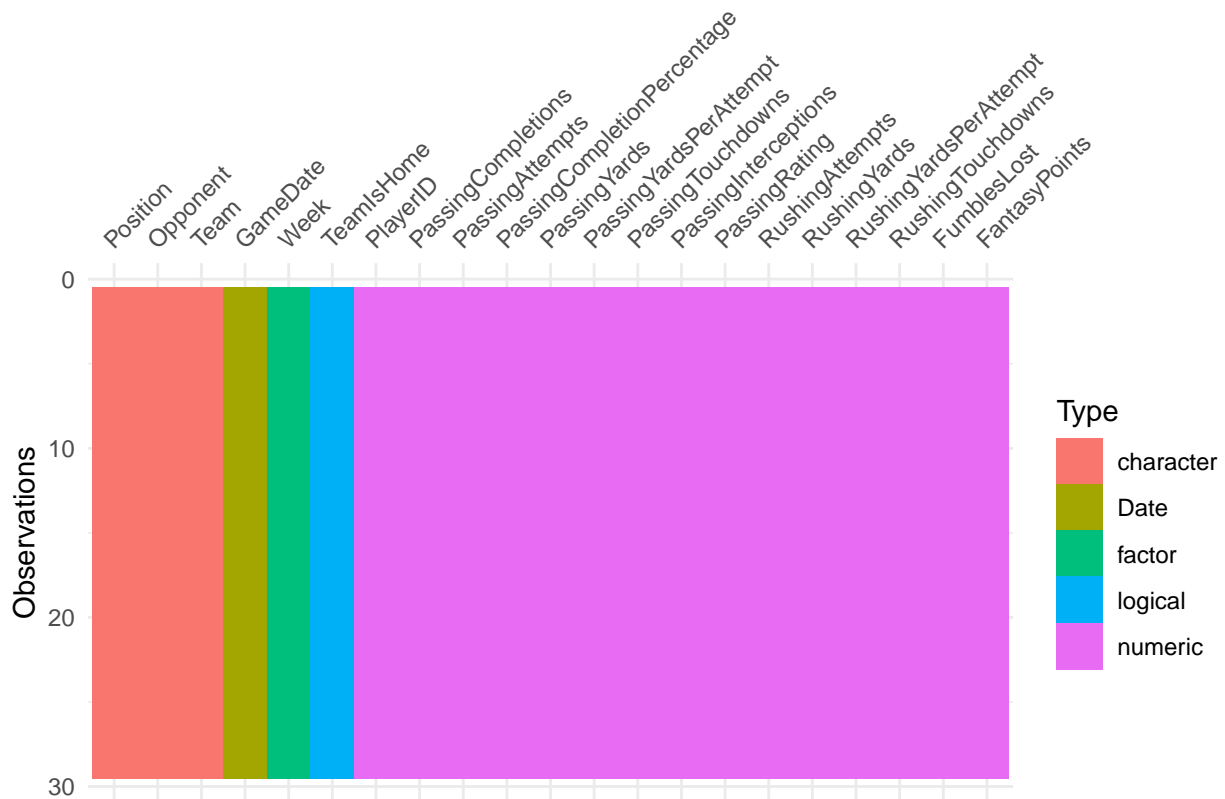




```
vis_dat(QBCrossSectional[31:60, ])
```

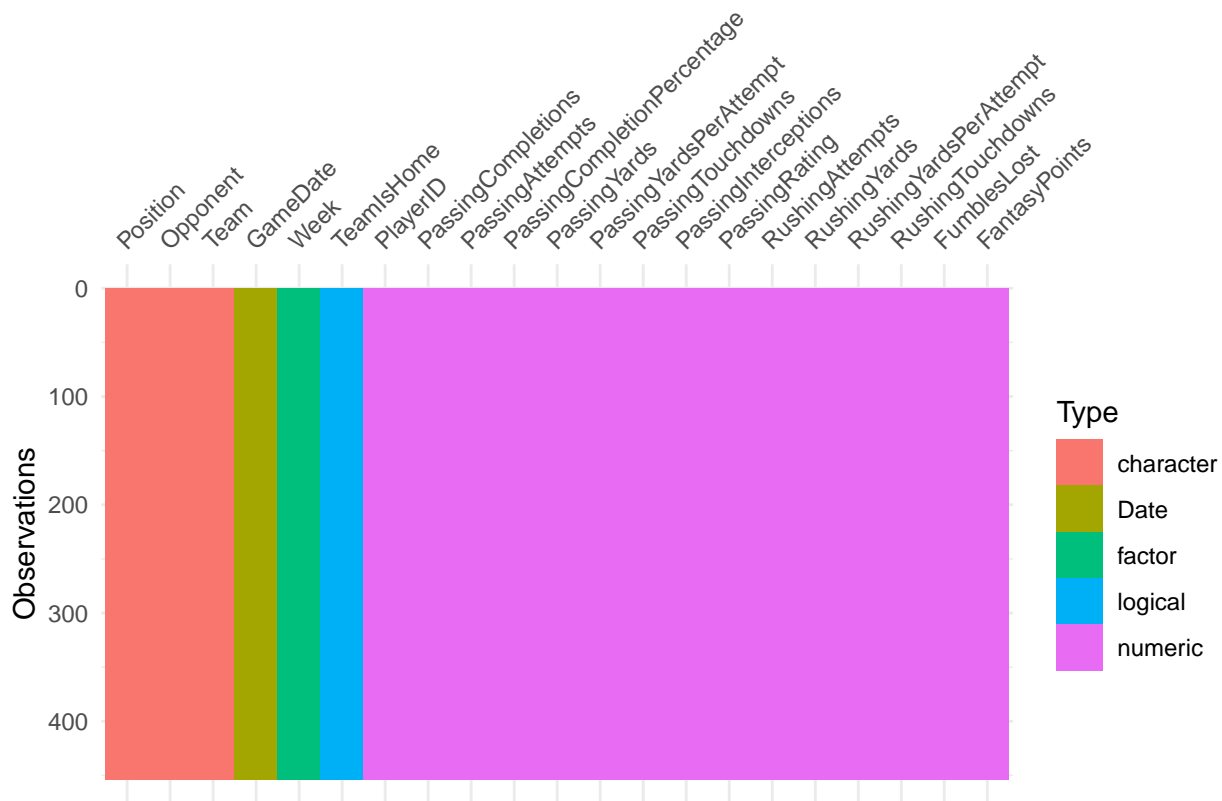


```
vis_dat(QBCrossSectional[61:89, ])
```



### 1.3.2 QBCrossSectional dataset (New dataset)

```
vis_dat(QBCrossSectional)
```



```
print(QBCrossSectional)
```

```
## # A tibble: 453 x 21
##   PlayerID Week  Position Opponent TeamIsHome GameDate  PassingCompleti~
##   <dbl> <fct> <chr>    <chr>    <lgl>    <date>      <dbl>
## 1     6739 13    QB      NYJ      FALSE    2017-12-03    19
## 2     4314 3     QB      HOU      TRUE     2017-09-24    25
## 3    13320 10    QB      MIA      TRUE     2017-11-13    21
## 4    18857 5     QB      KC       TRUE     2017-10-08    16
## 5    14536 8     QB      HOU      TRUE     2017-10-29    26
## 6    18857 4     QB      TEN      TRUE     2017-10-01    25
## 7    14536 3     QB      TEN      FALSE    2017-09-24    29
## 8    13320 4     QB      NE       FALSE    2017-10-01    22
## 9    18857 8     QB      SEA      FALSE    2017-10-29    19
## 10   13320 15    QB      GB       TRUE     2017-12-17    20
## # ... with 443 more rows, and 14 more variables: PassingAttempts <dbl>,
## #   PassingCompletionPercentage <dbl>, PassingYards <dbl>,
## #   PassingYardsPerAttempt <dbl>, PassingTouchdowns <dbl>,
## #   PassingInterceptions <dbl>, PassingRating <dbl>,
## #   RushingAttempts <dbl>, RushingYards <dbl>,
## #   RushingYardsPerAttempt <dbl>, RushingTouchdowns <dbl>,
## #   FumblesLost <dbl>, FantasyPoints <dbl>, Team <chr>
```

### 1.3.3 QBPanels dataset (New dataset)

```
print(QBPanels)
```

```
## $Opponent
## # A tibble: 56 x 18
```

```

##      PlayerID `1`  `2`  `3`  `4`  `5`  `6`  `7`  `8`  `9`  `10`
##      <dbl> <chr> <chr> <chr> <chr> <chr> <chr> <chr> <chr> <chr>
## 1      611 <NA> CLE  <NA> PIT  OAK  <NA> MIN  MIA  TEN  <NA>
## 2      732 CHI  GB   DET  BUF  <NA> MIA  NE   NYJ  CAR  DAL
## 3     2428 DET  IND  DAL  SF   PHI  TB   <NA> <NA> <NA> <NA>
## 4     2593 SEA  ATL  CIN  CHI  DAL  <NA> <NA> <NA> <NA> <NA>
## 5     3807 CLE  MIN  CHI  BAL  <NA> KC   CIN  DET  <NA> IND
## 6     4314 KC   NO   HOU  CAR  TB   NYJ  ATL  LAC  <NA> DEN
## 7     4737 <NA> <NA> <NA> <NA> <NA> <NA> <NA> <NA> SF   SEA
## 8     4932 <NA> DET  PHI  TB   LAC  DEN  SEA  <NA> LAR  SF
## 9     5282 BUF  OAK  MIA  <NA> CLE  NE   MIA  ATL  BUF  TB
## 10    5834 <NA> <NA> <NA> <NA> <NA> <NA> NYJ  <NA> <NA> <NA>
## # ... with 46 more rows, and 7 more variables: `11` <chr>, `12` <chr>,
## #   `13` <chr>, `14` <chr>, `15` <chr>, `16` <chr>, `17` <chr>
##
## $TeamIsHome
## # A tibble: 56 x 18
##      PlayerID `1`  `2`  `3`  `4`  `5`  `6`  `7`  `8`  `9`  `10`
##      <dbl> <lgl> <lgl> <lgl> <lgl> <lgl> <lgl> <lgl> <lgl> <lgl> <lgl>
## 1      611 NA    TRUE NA    TRUE FALSE NA    FALSE TRUE  FALSE NA
## 2      732 FALSE TRUE FALSE TRUE  NA    TRUE FALSE FALSE FALSE TRUE
## 3     2428 FALSE FALSE TRUE TRUE  FALSE TRUE  NA    NA    NA    NA
## 4     2593 TRUE  FALSE TRUE TRUE  FALSE NA    NA    NA    NA    NA
## 5     3807 FALSE TRUE FALSE FALSE NA    FALSE TRUE  FALSE NA    FALSE
## 6     4314 TRUE  FALSE TRUE TRUE  FALSE FALSE TRUE  TRUE  NA    FALSE
## 7     4737 NA    NA    NA    NA    NA    NA    NA    NA    FALSE TRUE
## 8     4932 NA    TRUE FALSE FALSE TRUE  FALSE TRUE  NA    TRUE  FALSE
## 9     5282 FALSE FALSE TRUE NA    FALSE TRUE  FALSE TRUE  TRUE  FALSE
## 10    5834 NA    NA    NA    NA    NA    NA    TRUE  NA    NA    NA
## # ... with 46 more rows, and 7 more variables: `11` <lgl>, `12` <lgl>,
## #   `13` <lgl>, `14` <lgl>, `15` <lgl>, `16` <lgl>, `17` <lgl>
##
## $PassingCompletions
## # A tibble: 56 x 18
##      PlayerID `1`  `2`  `3`  `4`  `5`  `6`  `7`  `8`  `9`  `10`
##      <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1      611 NA    25  NA   31   19  NA   27   10   34  NA
## 2      732 21   19  24  24  NA   24   23   18   24  22
## 3     2428 27   19  29  33  28   18  NA   NA   NA   NA
## 4     2593 28   33  28  18  19  NA  NA   NA   NA   NA
## 5     3807 24   23  22  18  NA   17  14   17  NA   19
## 6     4314 16   30  25  32  30  20  21   32  NA   25
## 7     4737 NA   NA   NA  NA  NA  NA  NA  NA   15  24
## 8     4932 NA   22  35  30  21  11  19  NA   20  28
## 9     5282 26   16  18  NA  23  31  17  26   14  23
## 10    5834 NA   NA   NA  NA  NA  NA  13  NA   NA   NA
## # ... with 46 more rows, and 7 more variables: `11` <dbl>, `12` <dbl>,
## #   `13` <dbl>, `14` <dbl>, `15` <dbl>, `16` <dbl>, `17` <dbl>
##
## $PassingAttempts
## # A tibble: 56 x 18
##      PlayerID `1`  `2`  `3`  `4`  `5`  `6`  `7`  `8`  `9`  `10`
##      <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1      611 NA    34  NA   49  26  NA   39   15   52  NA

```

```

## 2      732    30    28    35    42    NA    35    33    29    38    29
## 3     2428    48    36    48    51    44    22    NA    NA    NA    NA
## 4     2593    42    50    42    26    29    NA    NA    NA    NA    NA
## 5     3807    36    35    39    30    NA    25    24    31    NA    31
## 6     4314    36    39    35    45    40    38    29    47    NA    34
## 7     4737    NA    NA    NA    NA    NA    NA    NA    NA    NA    30
## 8     4932    NA    32    47    49    36    19    39    NA    36    37
## 9     5282    39    24    23    NA    30    47    27    33    20    39
## 10    5834    NA    NA    NA    NA    NA    NA    21    NA    NA    NA
## # ... with 46 more rows, and 7 more variables: `11` <dbl>, `12` <dbl>,
## #   `13` <dbl>, `14` <dbl>, `15` <dbl>, `16` <dbl>, `17` <dbl>
##
## $PassingCompletionPercentage
## # A tibble: 56 x 18
##   PlayerID `1` `2` `3` `4` `5` `6` `7` `8` `9` `10`
##   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1      611  NA   73.5  NA   63.3  73.1  NA   69.2  66.7  65.4  NA
## 2      732   70   67.9  68.6  57.1  NA   68.6  69.7  62.1  63.2  75.9
## 3     2428  56.2  52.8  60.4  64.7  63.6  81.8  NA    NA    NA    NA
## 4     2593  66.7   66   66.7  69.2  65.5  NA    NA    NA    NA    NA
## 5     3807  66.7  65.7  56.4   60   NA    68   58.3  54.8  NA    61.3
## 6     4314  44.4  76.9  71.4  71.1  75   52.6  72.4  68.1  NA    73.5
## 7     4737  NA    NA    NA    NA    NA    NA    NA    NA    50    51.1
## 8     4932  NA    68.8  74.5  61.2  58.3  57.9  48.7  NA    55.6  75.7
## 9     5282  66.7  66.7  78.3  NA    76.7  66    63   78.8  70    59
## 10    5834  NA    NA    NA    NA    NA    NA    61.9  NA    NA    NA
## # ... with 46 more rows, and 7 more variables: `11` <dbl>, `12` <dbl>,
## #   `13` <dbl>, `14` <dbl>, `15` <dbl>, `16` <dbl>, `17` <dbl>
##
## $PassingYards
## # A tibble: 56 x 18
##   PlayerID `1` `2` `3` `4` `5` `6` `7` `8` `9` `10`
##   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1      611   NA  217   NA  235  222   NA  186  101  261   NA
## 2      732  321  252  294  242   NA  248  233  254  313  215
## 3     2428  268  332  325  357  291  283   NA   NA   NA   NA
## 4     2593  311  343  313  179  221   NA   NA   NA   NA   NA
## 5     3807  263  243  235  216   NA  252  224  317   NA  236
## 6     4314  267  447  378  307  303  257  249  333   NA  266
## 7     4737   NA   NA   NA   NA   NA   NA   NA   NA  201  273
## 8     4932   NA  239  366  288  225  128  134   NA  220  273
## 9     5282  187  166  249   NA  194  354  209  257  140  262
## 10    5834   NA   NA   NA   NA   NA   NA  188   NA   NA   NA
## # ... with 46 more rows, and 7 more variables: `11` <dbl>, `12` <dbl>,
## #   `13` <dbl>, `14` <dbl>, `15` <dbl>, `16` <dbl>, `17` <dbl>
##
## $PassingYardsPerAttempt
## # A tibble: 56 x 18
##   PlayerID `1` `2` `3` `4` `5` `6` `7` `8` `9` `10`
##   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1      611   NA   6.4   NA   4.8   8.5   NA   4.8   6.7   5    NA
## 2      732 10.7   9    8.4   5.8   NA    7.1   7.1   8.8   8.2   7.4
## 3     2428   5.6   9.2   6.8   7    6.6  12.9   NA   NA   NA   NA
## 4     2593   7.4   6.9   7.5   6.9   7.6   NA    NA   NA   NA   NA

```

```

## 5      3807  7.3  6.9  6      7.2 NA      10.1  9.3  10.2 NA      7.6
## 6      4314  7.4 11.5 10.8  6.8  7.6  6.8  8.6  7.1 NA      7.8
## 7      4737 NA    NA    NA    NA    NA    NA    NA    NA    6.7  5.8
## 8      4932 NA    7.5  7.8  5.9  6.2  6.7  3.4 NA    6.1  7.4
## 9      5282  4.8  6.9 10.8 NA    6.5  7.5  7.7  7.8  7    6.7
## 10     5834 NA    NA    NA    NA    NA    NA    9    NA    NA    NA
## # ... with 46 more rows, and 7 more variables: `11` <dbl>, `12` <dbl>,
## #   `13` <dbl>, `14` <dbl>, `15` <dbl>, `16` <dbl>, `17` <dbl>
##
## $PassingTouchdowns
## # A tibble: 56 x 18
##   PlayerID `1` `2` `3` `4` `5` `6` `7` `8` `9` `10`
##   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1      611  NA    2    NA    1    0    NA    1    1    2    NA
## 2      732    1    1    2    1   NA    1    1    2    2    2
## 3     2428    1    1    2    1    1    3   NA   NA   NA   NA
## 4     2593    1    2    3    4    3   NA   NA   NA   NA   NA
## 5     3807    2    2    1    1   NA    1    2    1   NA    2
## 6     4314    0    3    5    2    1    2    2    1   NA    3
## 7     4737   NA   NA   NA   NA   NA   NA   NA   NA    2    1
## 8     4932   NA    1    3    2    2    1    1   NA    2    2
## 9     5282    0    2    1   NA    2    2    3    2    1    1
## 10    5834   NA   NA   NA   NA   NA   NA    2   NA   NA   NA
## # ... with 46 more rows, and 7 more variables: `11` <dbl>, `12` <dbl>,
## #   `13` <dbl>, `14` <dbl>, `15` <dbl>, `16` <dbl>, `17` <dbl>
##
## $PassingInterceptions
## # A tibble: 56 x 18
##   PlayerID `1` `2` `3` `4` `5` `6` `7` `8` `9` `10`
##   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1      611  NA    1    NA    2    0   NA    0    0    2    NA
## 2      732    0    0    3    2   NA    1    0    0    1    1
## 3     2428    3    1    0    1    0    1   NA   NA   NA   NA
## 4     2593    1    1    1    0    0   NA   NA   NA   NA   NA
## 5     3807    1    0    0    1   NA    1    0    1   NA    1
## 6     4314    0    0    0    0    1    1    0    0   NA    0
## 7     4737   NA   NA   NA   NA   NA   NA   NA   NA    1    0
## 8     4932   NA    1    2    0    1    0    0   NA    1    0
## 9     5282    2    0    0   NA    1    2    1    0    0    1
## 10    5834   NA   NA   NA   NA   NA   NA    1   NA   NA   NA
## # ... with 46 more rows, and 7 more variables: `11` <dbl>, `12` <dbl>,
## #   `13` <dbl>, `14` <dbl>, `15` <dbl>, `16` <dbl>, `17` <dbl>
##
## $PassingRating
## # A tibble: 56 x 18
##   PlayerID `1` `2` `3` `4` `5` `6` `7` `8` `9` `10`
##   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1      611  NA  97.3  NA  64.6 98.6  NA  88.2 108.  74.3  NA
## 2      732 116. 108.  77.6 61.8  NA  86.4 99.7 113.  95.6 105.
## 3     2428 53.1 82.2  94.5 83.5 90.2 139.  NA   NA   NA   NA
## 4     2593 86.5 90.7 103. 128. 123.  NA   NA   NA   NA   NA
## 5     3807 95.0 105.  82.8 79.3  NA  97.4 117.  87.7  NA  92.9
## 6     4314 70.0 140. 146. 105.  94.1 80.7 121.  95.4  NA 125.
## 7     4737  NA   NA   NA   NA   NA   NA   NA   NA   80  75.9

```

```

## 8      4932 NA      87.9 100.    91.2 83.7 95.9 65.5 NA      80.8 114.
## 9      5282 56.2 114. 126.    NA 101. 84.9 108. 119. 106. 77.1
## 10     5834 NA      NA      NA      NA      NA      NA 103.    NA      NA      NA
## # ... with 46 more rows, and 7 more variables: `11` <dbl>, `12` <dbl>,
## #   `13` <dbl>, `14` <dbl>, `15` <dbl>, `16` <dbl>, `17` <dbl>
##
## $RushingAttempts
## # A tibble: 56 x 18
##   PlayerID `1` `2` `3` `4` `5` `6` `7` `8` `9` `10`
##   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1      611 NA      1 NA      0 3 NA      1 1 1 NA
## 2      732 3      1 1      1 NA 0      3 6 1 0
## 3     2428 1      3 3      2 0 5 NA     NA NA NA
## 4     2593 7      2 4      1 4 NA     NA NA NA
## 5     3807 3      2 1      1 NA 2      3 3 NA 2
## 6     4314 2      2 1      1 2 1      5 1 NA 1
## 7     4737 NA     NA NA     NA NA NA     NA NA 4 1
## 8     4932 NA      0 0      3 0 1      0 NA 0 0
## 9     5282 2      4 4      NA 3 3      3 1 5 0
## 10    5834 NA     NA NA     NA NA NA     0 NA NA NA
## # ... with 46 more rows, and 7 more variables: `11` <dbl>, `12` <dbl>,
## #   `13` <dbl>, `14` <dbl>, `15` <dbl>, `16` <dbl>, `17` <dbl>
##
## $RushingYards
## # A tibble: 56 x 18
##   PlayerID `1` `2` `3` `4` `5` `6` `7` `8` `9` `10`
##   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1      611 NA     -1 NA      0 -4 NA      0 9 7 NA
## 2      732 11      8 -1      8 NA 0      37 17 -1 0
## 3     2428 2      6 7      1 0 -4 NA     NA NA NA
## 4     2593 21      8 23     -1 32 NA     NA NA NA
## 5     3807 -8     -2 6     -1 NA -2     -3 -2 NA 5
## 6     4314 0      9 6      2 5 -1      5 2 NA 0
## 7     4737 NA     NA NA     NA NA NA     NA NA 2 1
## 8     4932 NA      0 0      22 0 0      0 NA 0 0
## 9     5282 0      31 7      NA -3 21      1 0 13 0
## 10    5834 NA     NA NA     NA NA NA     0 NA NA NA
## # ... with 46 more rows, and 7 more variables: `11` <dbl>, `12` <dbl>,
## #   `13` <dbl>, `14` <dbl>, `15` <dbl>, `16` <dbl>, `17` <dbl>
##
## $RushingYardsPerAttempt
## # A tibble: 56 x 18
##   PlayerID `1` `2` `3` `4` `5` `6` `7` `8` `9` `10`
##   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1      611 NA     -1 NA      0 -1.3 NA      0 9 7 NA
## 2      732 3.7 8     -1 8      NA 0      12.3 2.8 -1 0
## 3     2428 2      2 2.3 0.5 0 -0.8 NA     NA NA NA
## 4     2593 3      4 5.8 -1 8 NA     NA NA NA
## 5     3807 -2.7 -1 6     -1 NA -1     -1 -0.7 NA 2.5
## 6     4314 0      4.5 6      2 2.5 -1 1      2 NA 0
## 7     4737 NA     NA NA     NA NA NA     NA NA 0.5 1
## 8     4932 NA      0 0      7.3 0 0      0 NA 0 0
## 9     5282 0      7.8 1.8 NA -1 7      0.3 0 2.6 0
## 10    5834 NA     NA NA     NA NA NA     0 NA NA NA

```

```

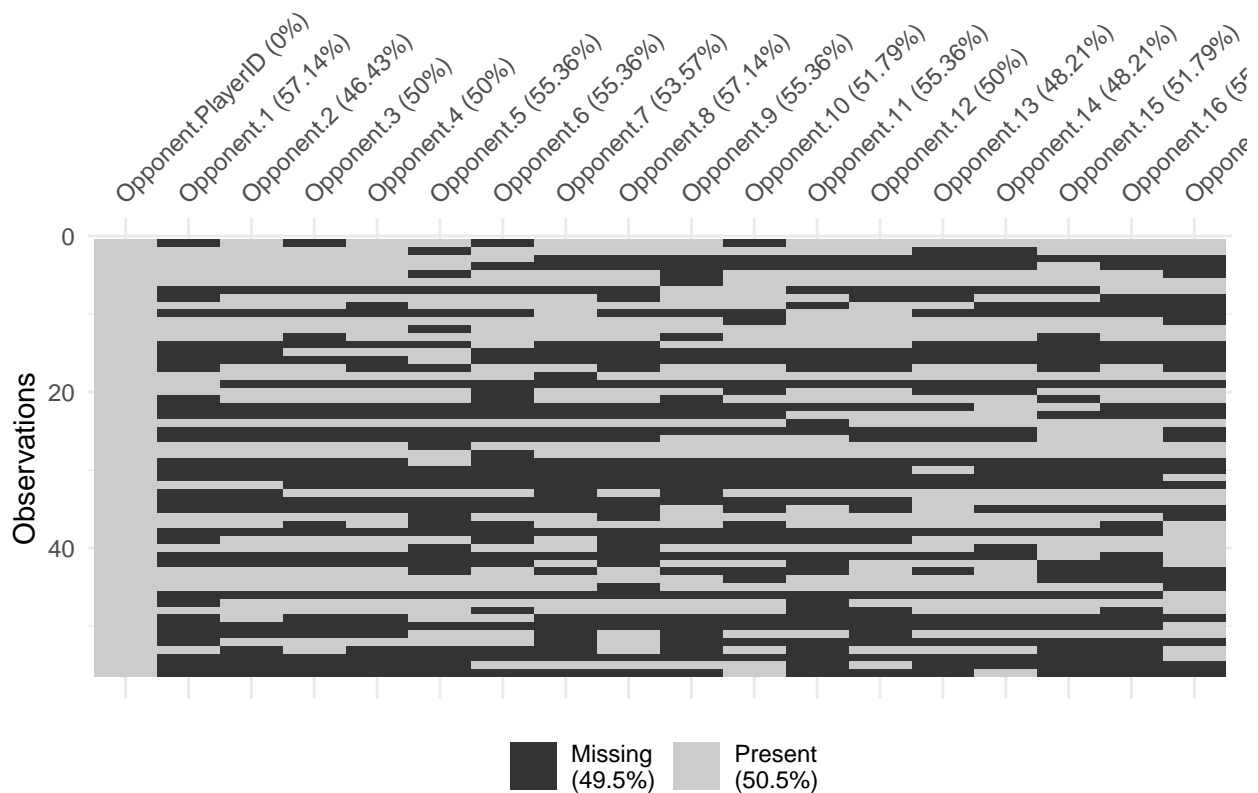
## # ... with 46 more rows, and 7 more variables: `11` <dbl>, `12` <dbl>,
## #   `13` <dbl>, `14` <dbl>, `15` <dbl>, `16` <dbl>, `17` <dbl>
##
## $RushingTouchdowns
## # A tibble: 56 x 18
##   PlayerID `1` `2` `3` `4` `5` `6` `7` `8` `9` `10`
##   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1     611   NA    0   NA    0    0   NA    0    0    0   NA
## 2     732    0    0    0    0   NA    0    0    0    0    0
## 3    2428    0    0    0    0    0    0   NA   NA   NA   NA
## 4    2593    0    0    0    0    0   NA   NA   NA   NA   NA
## 5    3807    0    0    0    0   NA    0    0    0   NA    0
## 6    4314    0    0    0    0    0    0    0    0   NA    0
## 7    4737   NA   NA   NA   NA   NA   NA   NA   NA    0    0
## 8    4932   NA    0    0    1    0    0    0   NA    0    0
## 9    5282    1    0    0   NA    0    0    1    0    1    0
## 10   5834   NA   NA   NA   NA   NA   NA    0   NA   NA   NA
## # ... with 46 more rows, and 7 more variables: `11` <dbl>, `12` <dbl>,
## #   `13` <dbl>, `14` <dbl>, `15` <dbl>, `16` <dbl>, `17` <dbl>
##
## $FumblesLost
## # A tibble: 56 x 18
##   PlayerID `1` `2` `3` `4` `5` `6` `7` `8` `9` `10`
##   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1     611   NA    0   NA    0    0   NA    0    0    0   NA
## 2     732    0    0    0    1   NA    0    0    2    0    0
## 3    2428    0    0    0    0    0    0   NA   NA   NA   NA
## 4    2593    0    1    0    0    0   NA   NA   NA   NA   NA
## 5    3807    0    0    1    0   NA    0    0    0   NA    0
## 6    4314    0    0    1    0    1    0    0    0   NA    0
## 7    4737   NA   NA   NA   NA   NA   NA   NA   NA    0    0
## 8    4932   NA    0    0    0    1    0    1   NA    1    1
## 9    5282    0    1    0   NA    0    0    0    0    0    0
## 10   5834   NA   NA   NA   NA   NA   NA    0   NA   NA   NA
## # ... with 46 more rows, and 7 more variables: `11` <dbl>, `12` <dbl>,
## #   `13` <dbl>, `14` <dbl>, `15` <dbl>, `16` <dbl>, `17` <dbl>
##
## $FantasyPoints
## # A tibble: 56 x 18
##   PlayerID `1` `2` `3` `4` `5` `6` `7` `8` `9` `10`
##   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1     611   NA   14.6   NA    9.4  8.48   NA   11.4   8.94  15.1   NA
## 2     732  17.9   14.9  13.7   8.48   NA   11.9  17.0  15.9  18.4  14.6
## 3    2428   8.92  15.9  21.7  16.4  15.6  20.9   NA   NA   NA   NA
## 4    2593  16.5  18.5  24.8  23.1  24.0   NA   NA   NA   NA   NA
## 5    3807  15.7  17.5  12    10.5   NA   11.9  16.7  14.5   NA  17.9
## 6    4314  10.7  30.8  35.7  20.5  12.6  16.2  18.5  17.5   NA  22.6
## 7    4737   NA   NA   NA   NA   NA   NA   NA   NA   14.2  15.0
## 8    4932   NA   11.6  22.6  27.7  13    9.12  7.36   NA   12.8  16.9
## 9    5282   9.48  15.7  14.7   NA   13.5  20.3  24.5  18.3  16.9  12.5
## 10   5834   NA   NA   NA   NA   NA   NA   13.5   NA   NA   NA
## # ... with 46 more rows, and 7 more variables: `11` <dbl>, `12` <dbl>,
## #   `13` <dbl>, `14` <dbl>, `15` <dbl>, `16` <dbl>, `17` <dbl>
##

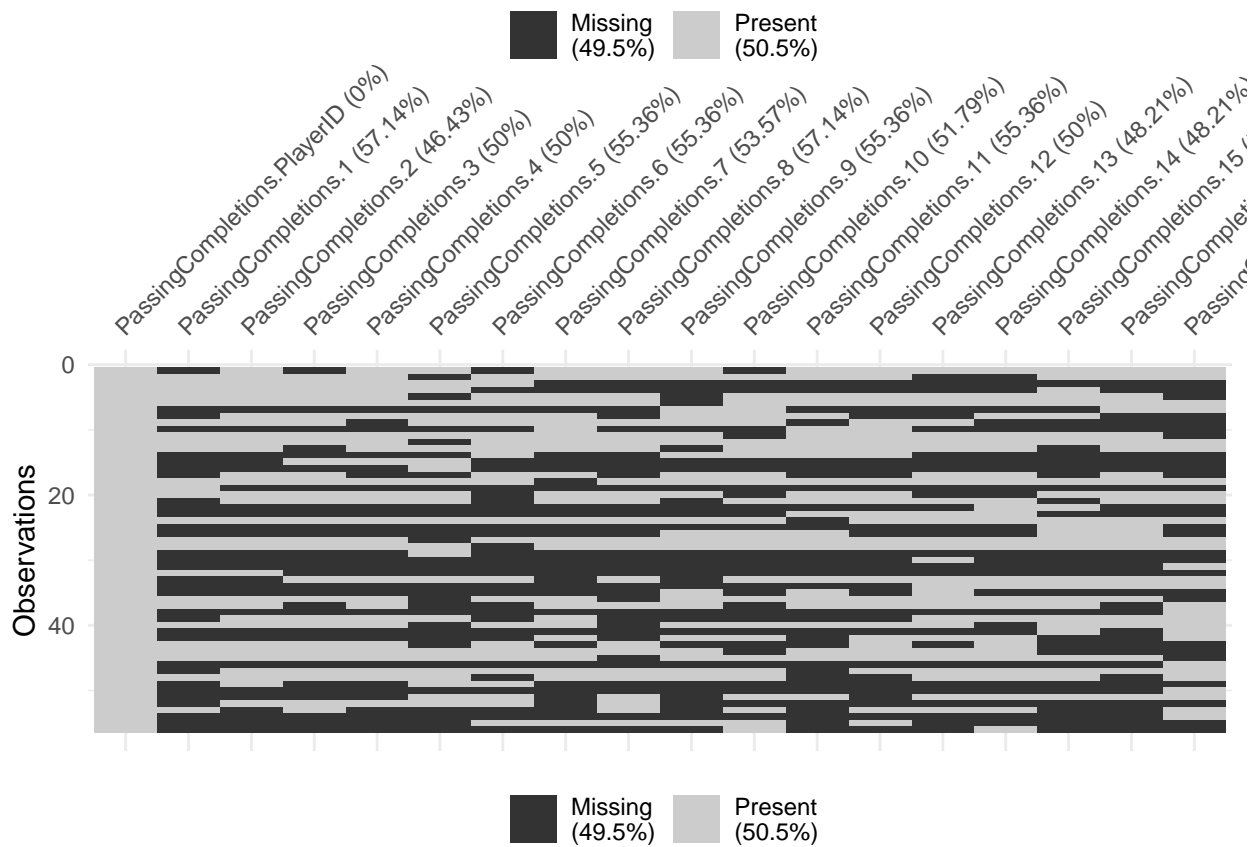
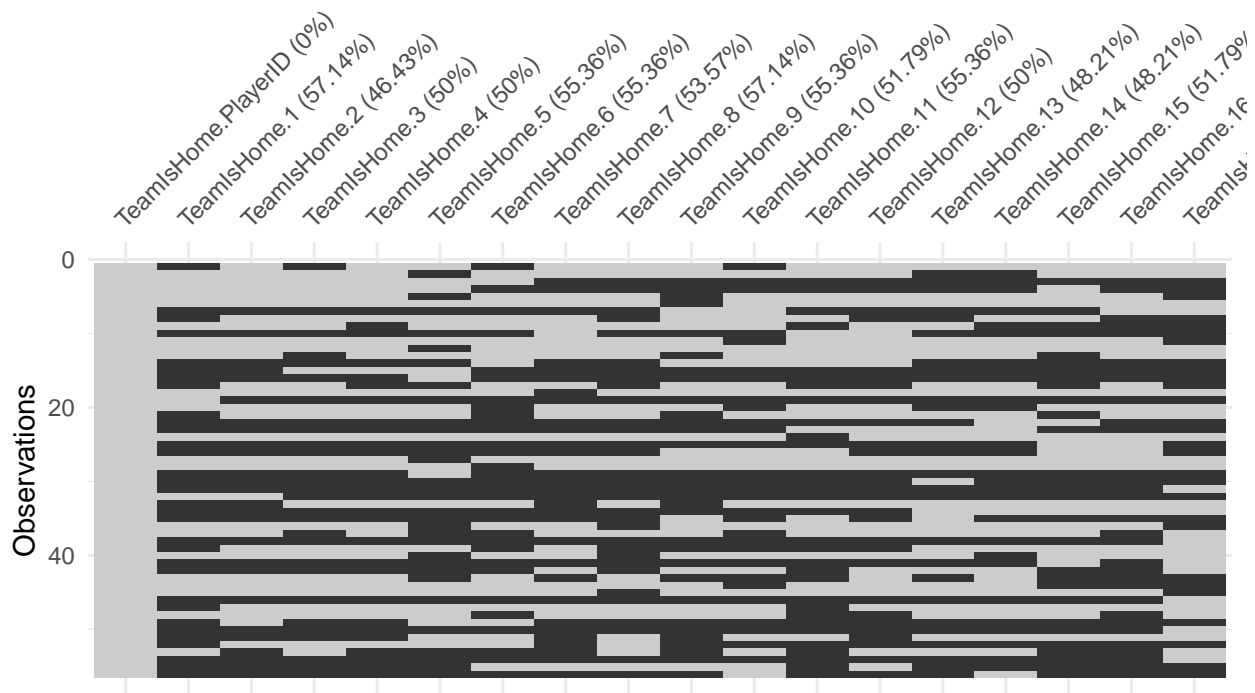
```

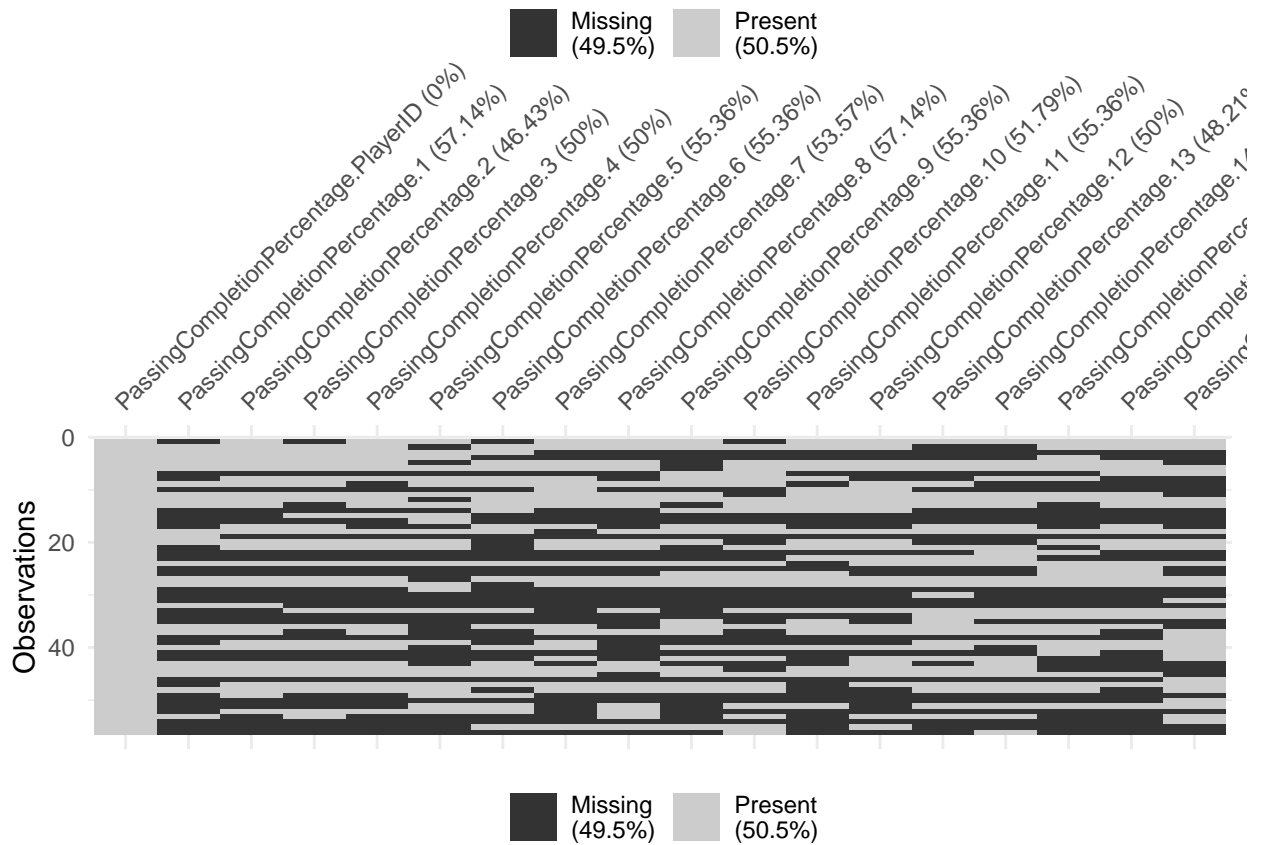
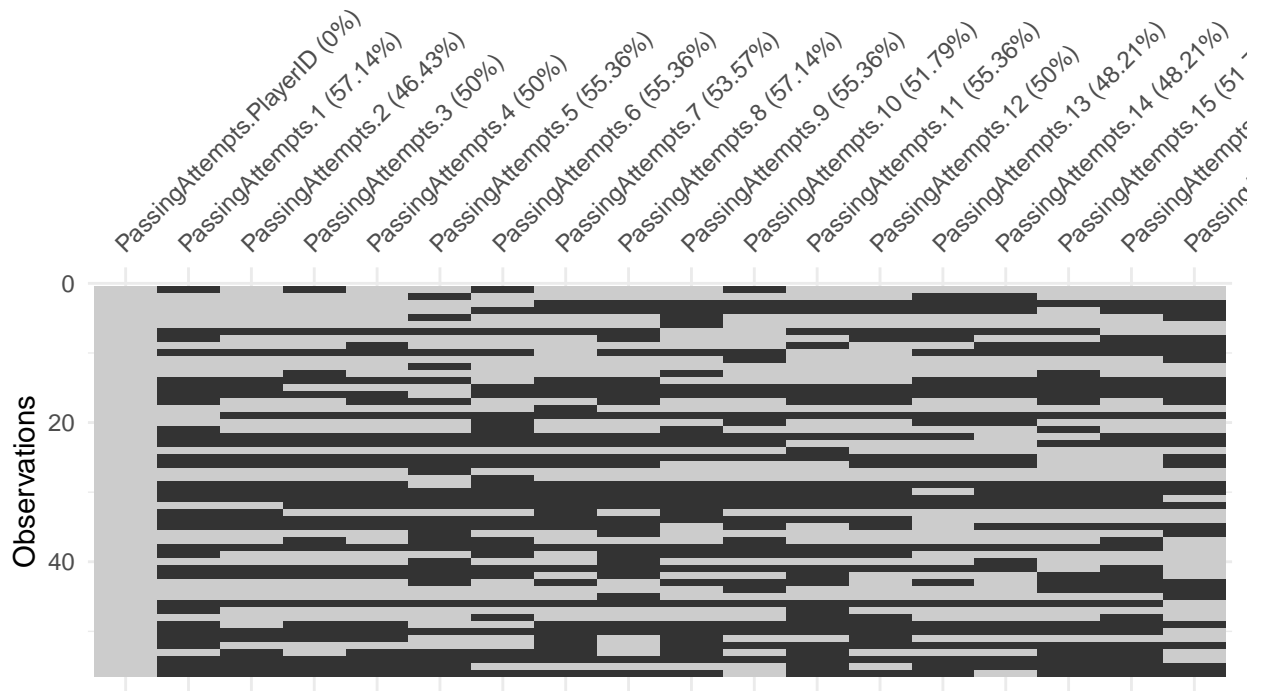


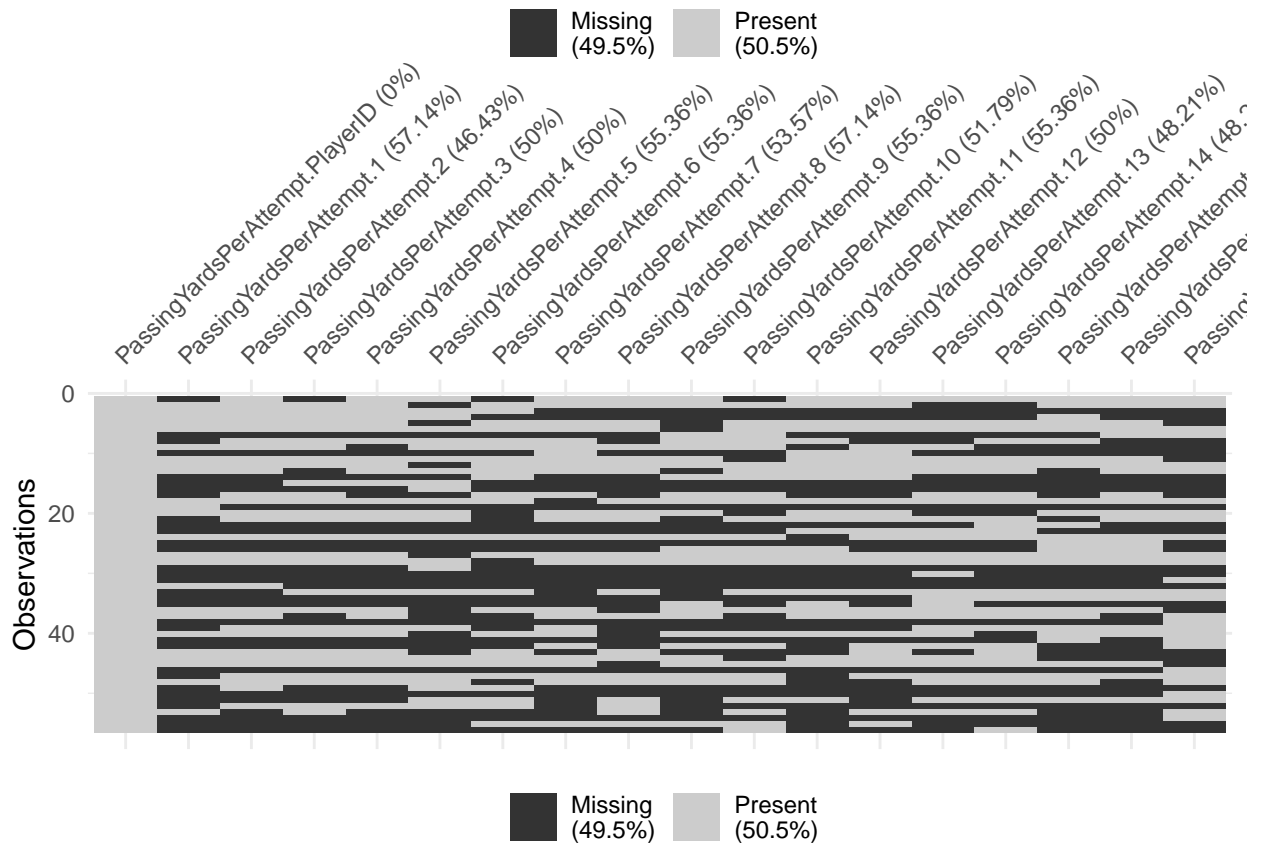
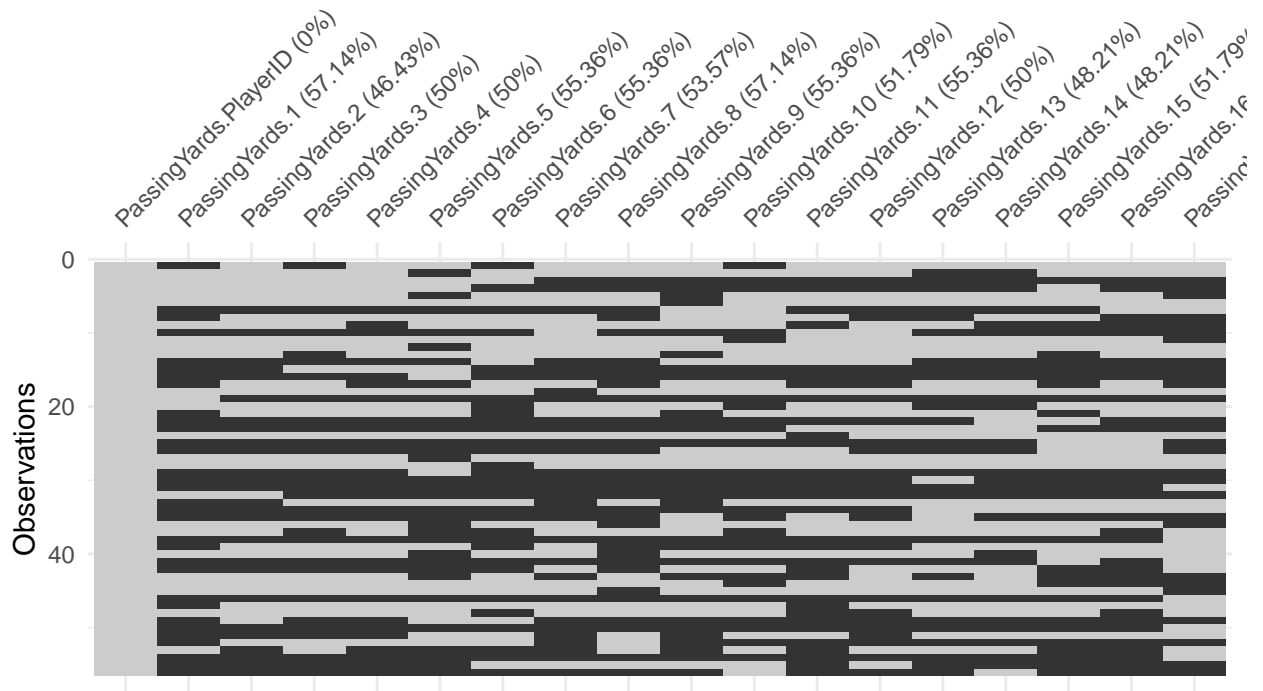
```
## $Team
## # A tibble: 56 x 18
##   PlayerID `1`  `2`  `3`  `4`  `5`  `6`  `7`  `8`  `9`  `10`
##   <dbl> <chr> <chr> <chr> <chr> <chr> <chr> <chr> <chr> <chr> <chr>
## 1     611 <NA> BAL  <NA> BAL  BAL  <NA> BAL  BAL  BAL  <NA>
## 2     732 ATL  ATL  ATL  ATL  <NA> ATL  ATL  ATL  ATL  ATL
## 3    2428 ARI  ARI  ARI  ARI  ARI  ARI  <NA> <NA> <NA> <NA>
## 4    2593 GB   GB   GB   GB   GB   <NA> <NA> <NA> <NA> <NA>
## 5    3807 PIT  PIT  PIT  PIT  <NA> PIT  PIT  PIT  <NA> PIT
## 6    4314 NE   NE   NE   NE   NE   NE   NE   NE   <NA> NE
## 7    4737 <NA> <NA> <NA> <NA> <NA> <NA> <NA> <NA> ARI  ARI
## 8    4932 <NA> NYG  NYG  NYG  NYG  NYG  NYG  <NA> NYG  NYG
## 9    5282 NYJ  NYJ  NYJ  <NA> NYJ  NYJ  NYJ  NYJ  NYJ  NYJ
## 10   5834 <NA> <NA> <NA> <NA> <NA> <NA> MIA  <NA> <NA> <NA>
## # ... with 46 more rows, and 7 more variables: `11` <chr>, `12` <chr>,
## #   `13` <chr>, `14` <chr>, `15` <chr>, `16` <chr>, `17` <chr>
```

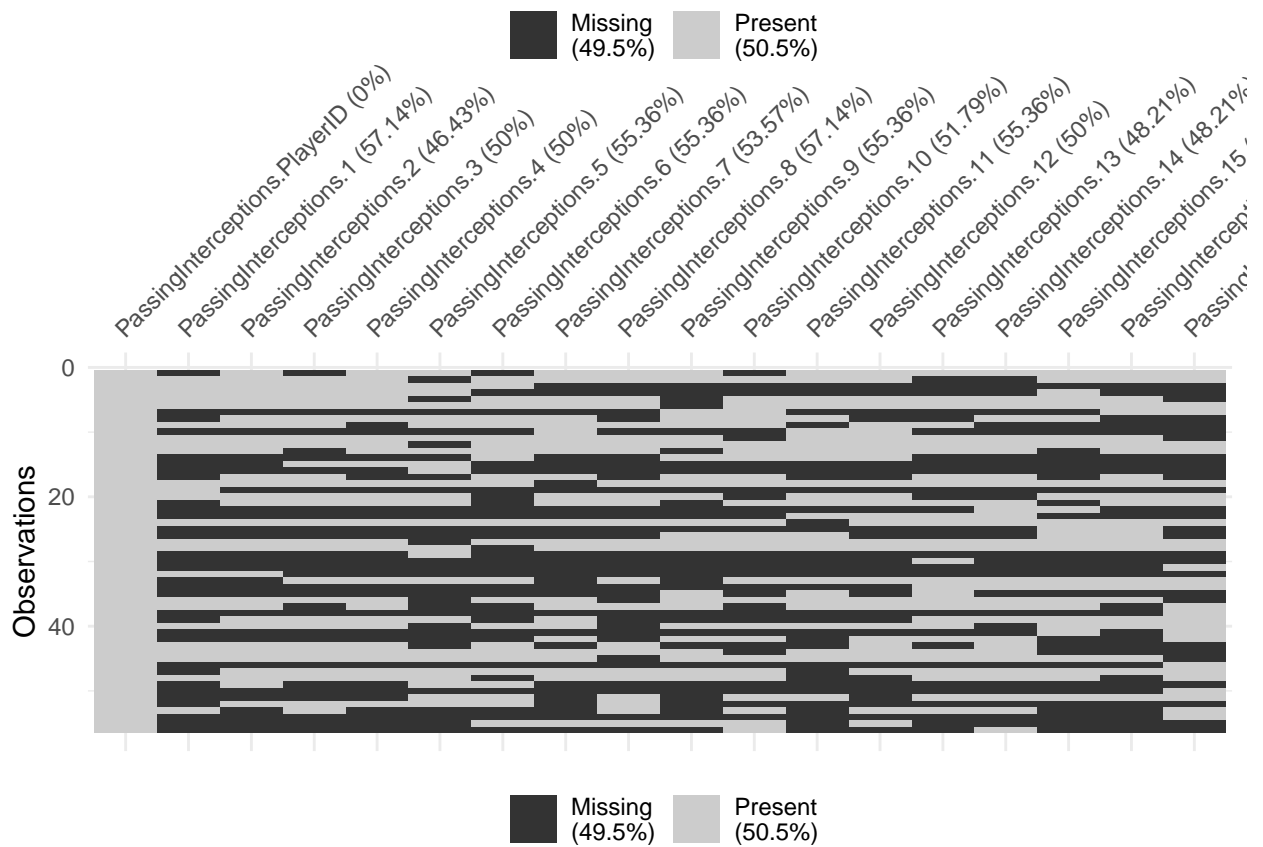
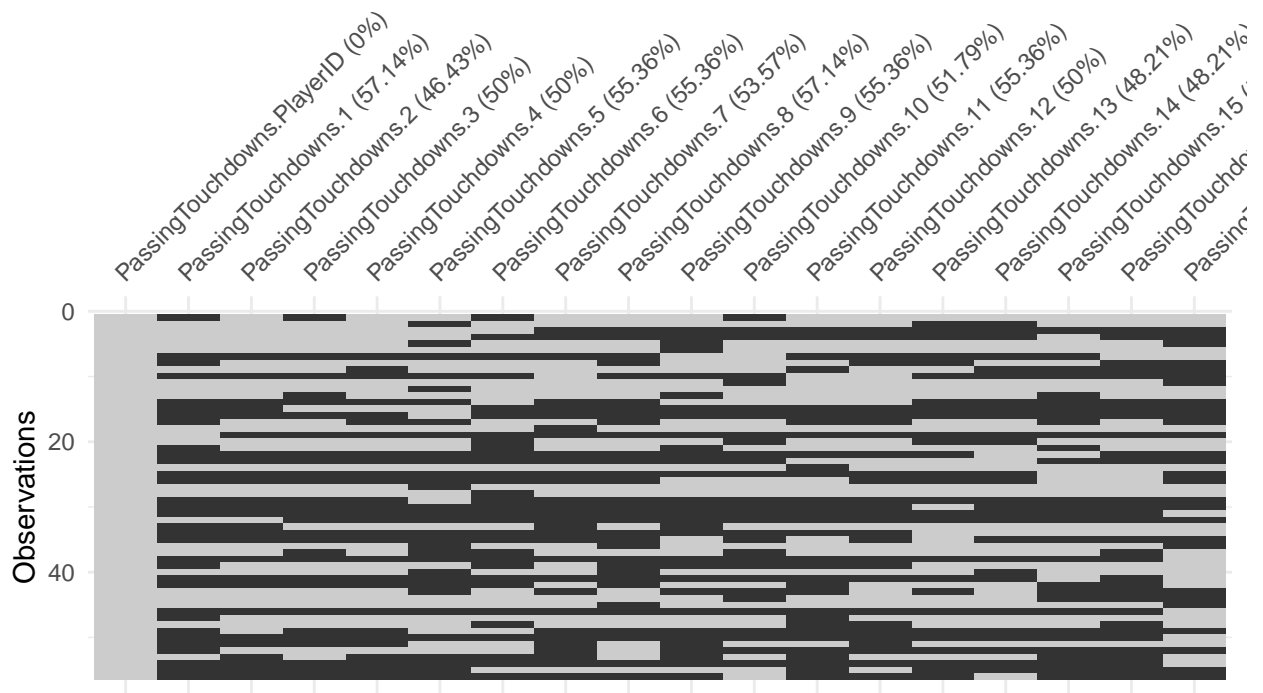
```
for (panel in 1:length(QBPanels)) {
  missing_plot <- vis_miss(as.data.frame(QBPanels[panel]))
  print(missing_plot)
}
```

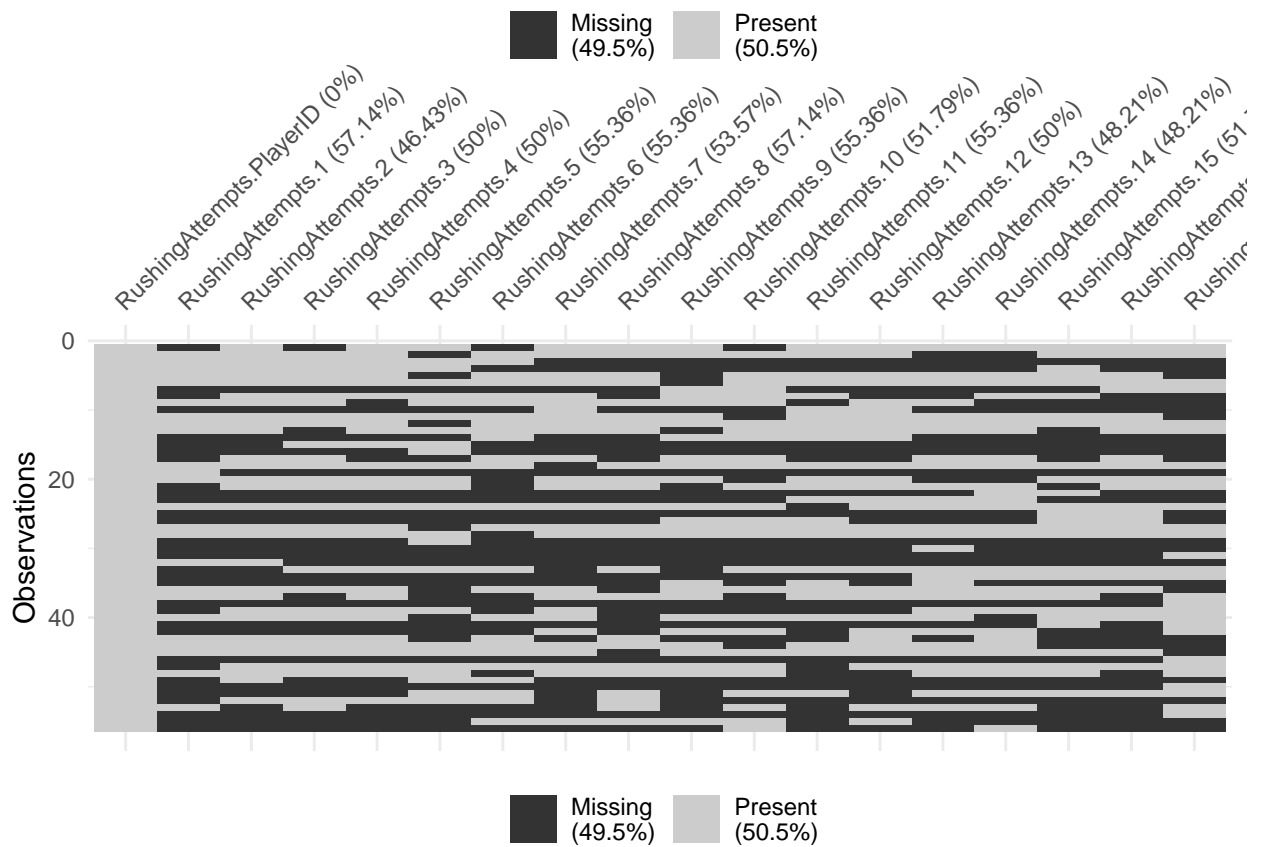
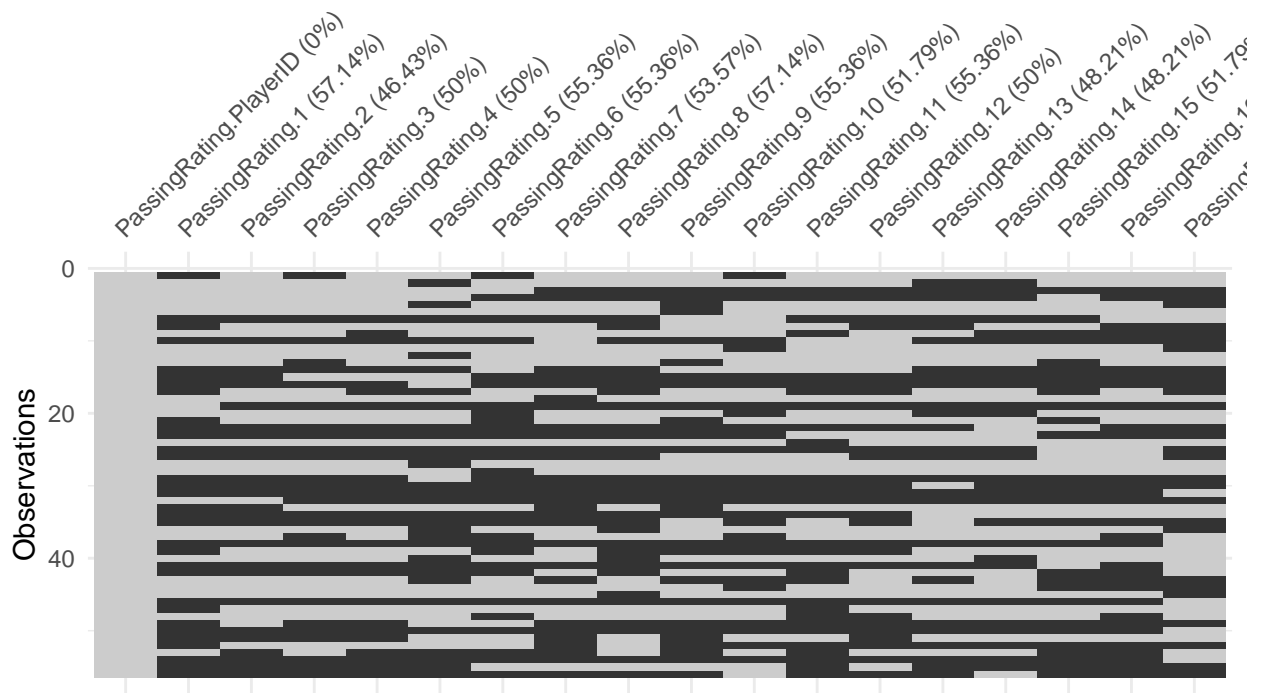


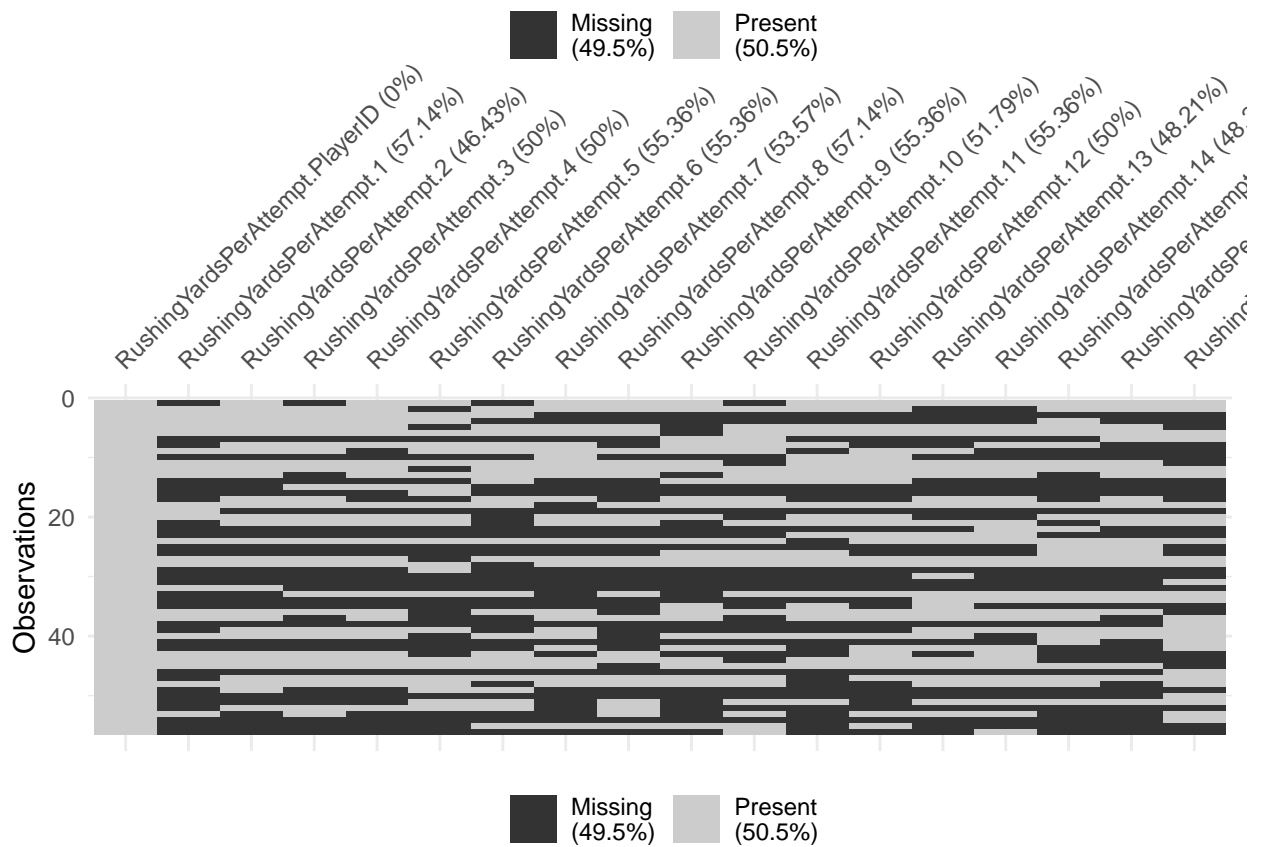
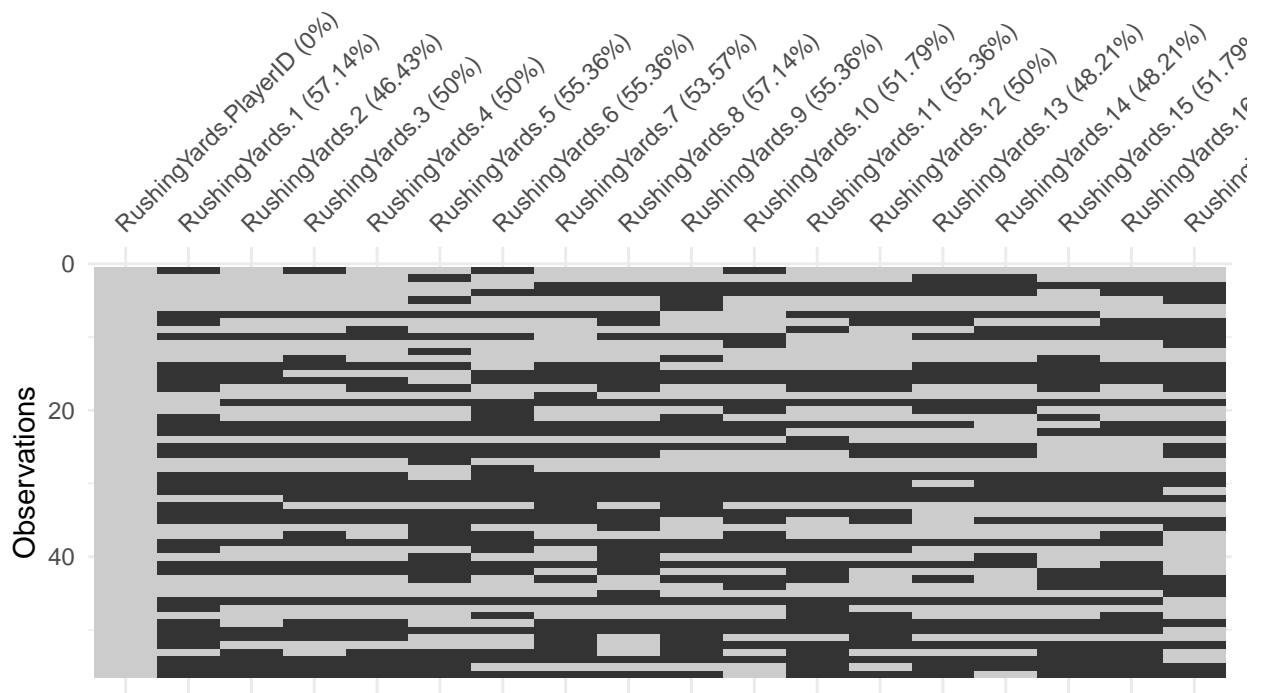


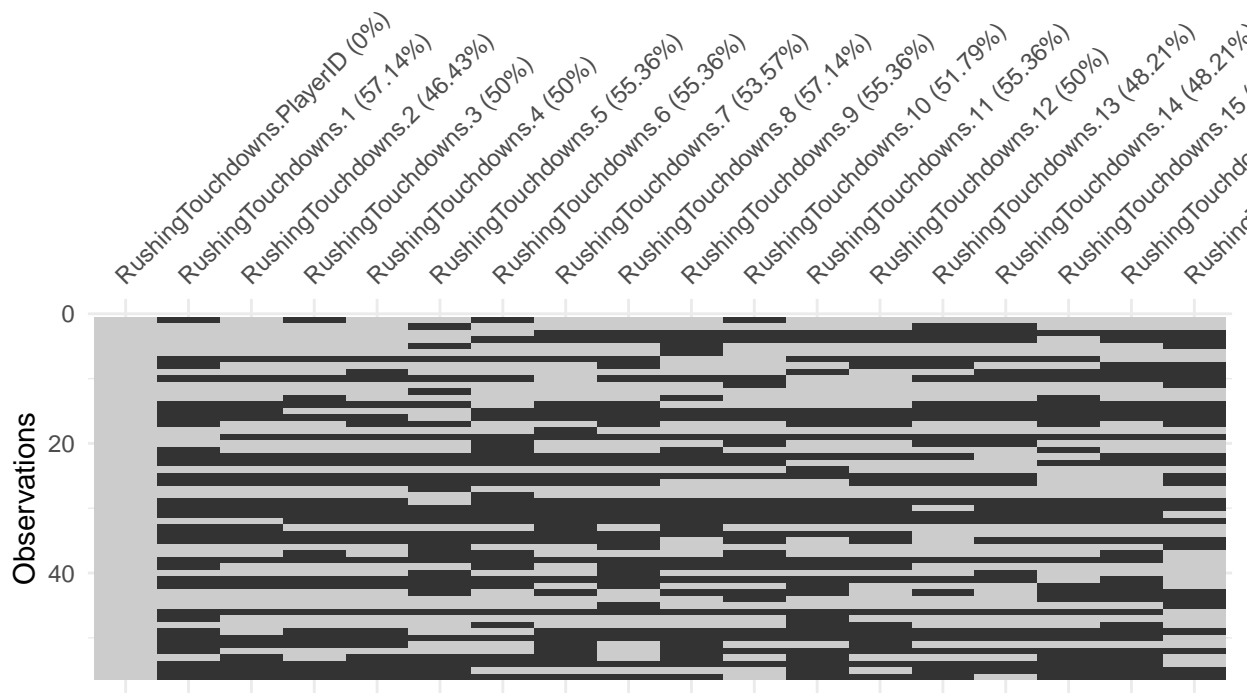




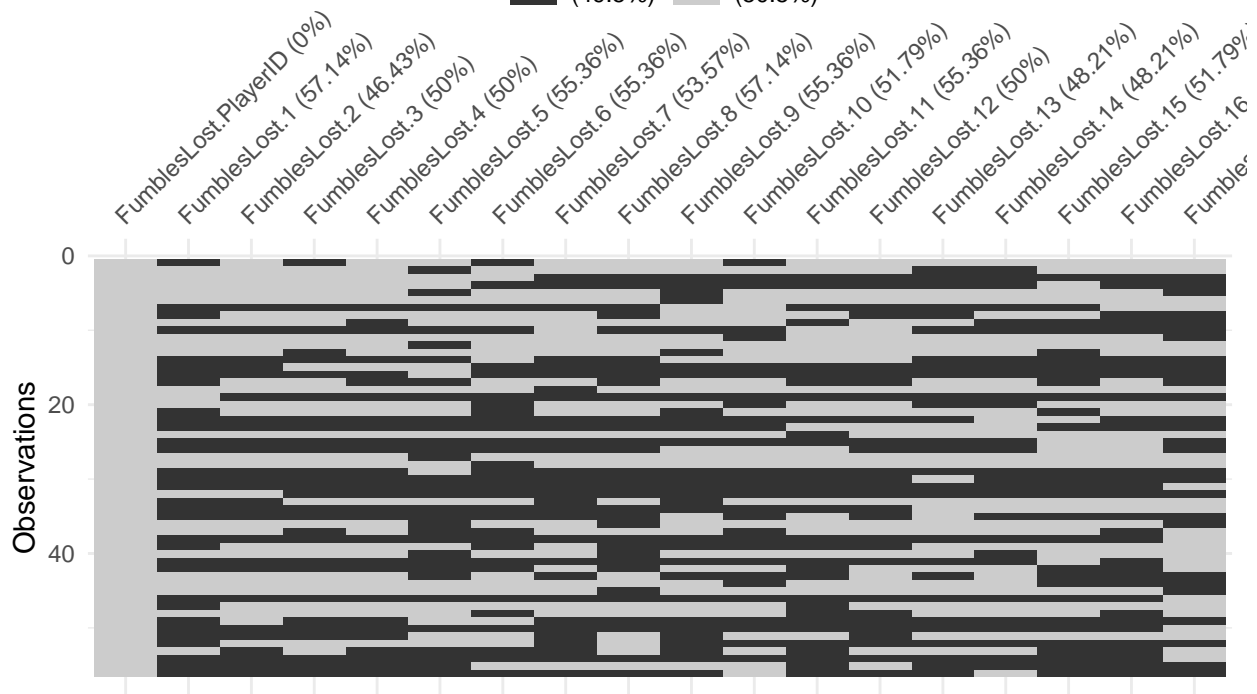






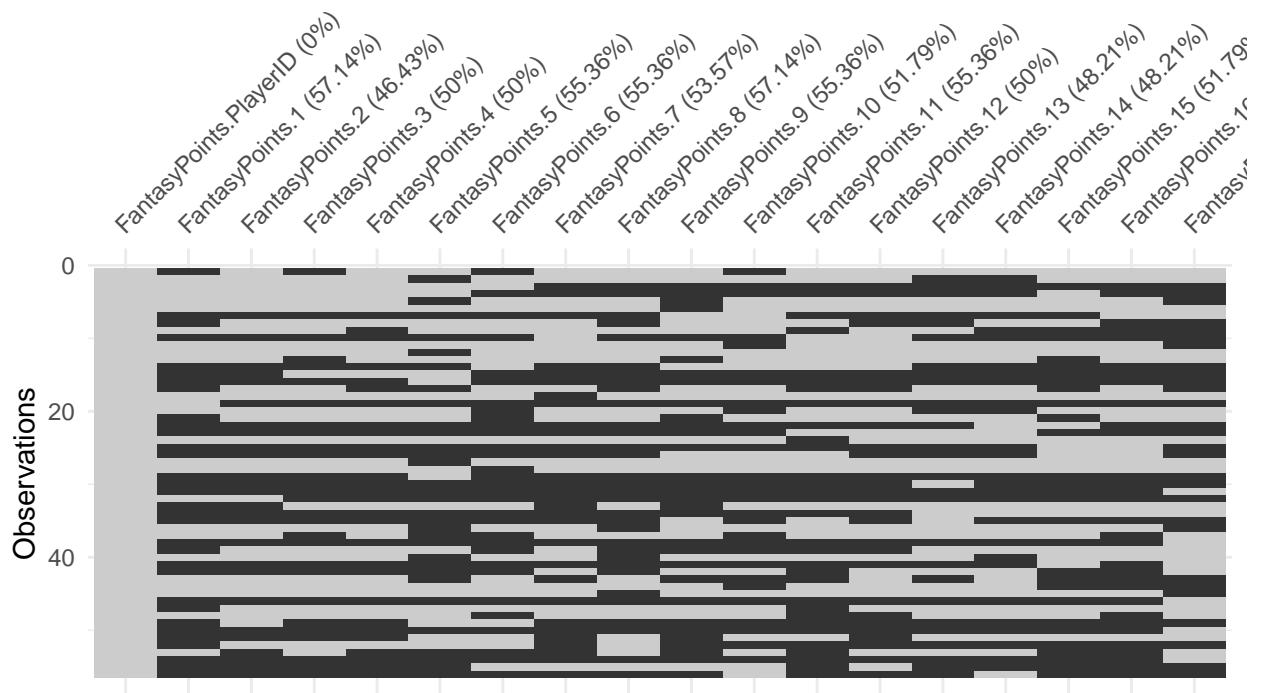


Missing (49.5%) Present (50.5%)

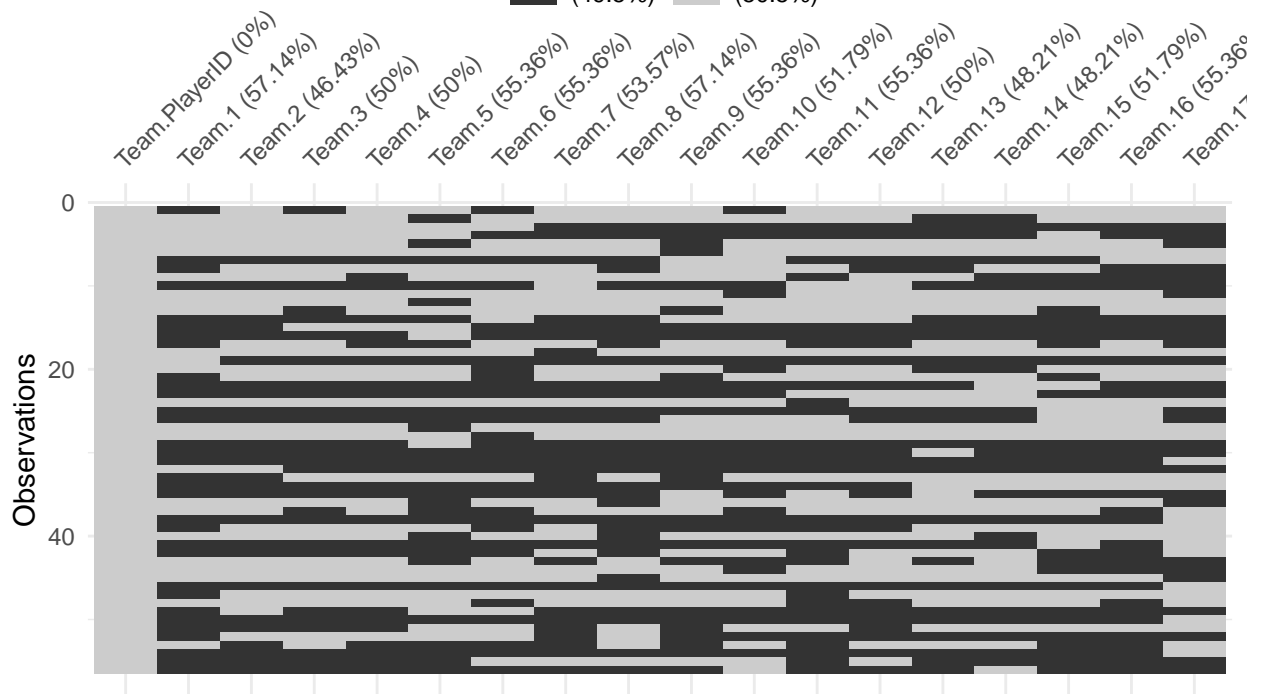


Missing (49.5%) Present (50.5%)





Missing (49.5%)
  Present (50.5%)



Missing (49.5%)
  Present (50.5%)

## 1.4: Corrrelogram

### 1.4.1 Corrrrelogram Style1 QBData (Old dataset)

```
#QBdata_num <- QBCrossSectional[-c(1:3,5:16,29:36,39:52,55:56,74:89)]
#corr <- round(cor(QBdata_num), 1)

#ggcorrplot(corr, hc.order = TRUE,
#           type = "full",
#           lab = TRUE,
#           lab_size = 1.5,
#           method="square",
#           colors = c("tomato2", "white", "springgreen3"),
#           title="Correlogram of Quarterbacks", tl.cex = 7,pch=2,pch.col =3,show.diag = T,
#           ggtheme=theme_classic)
```

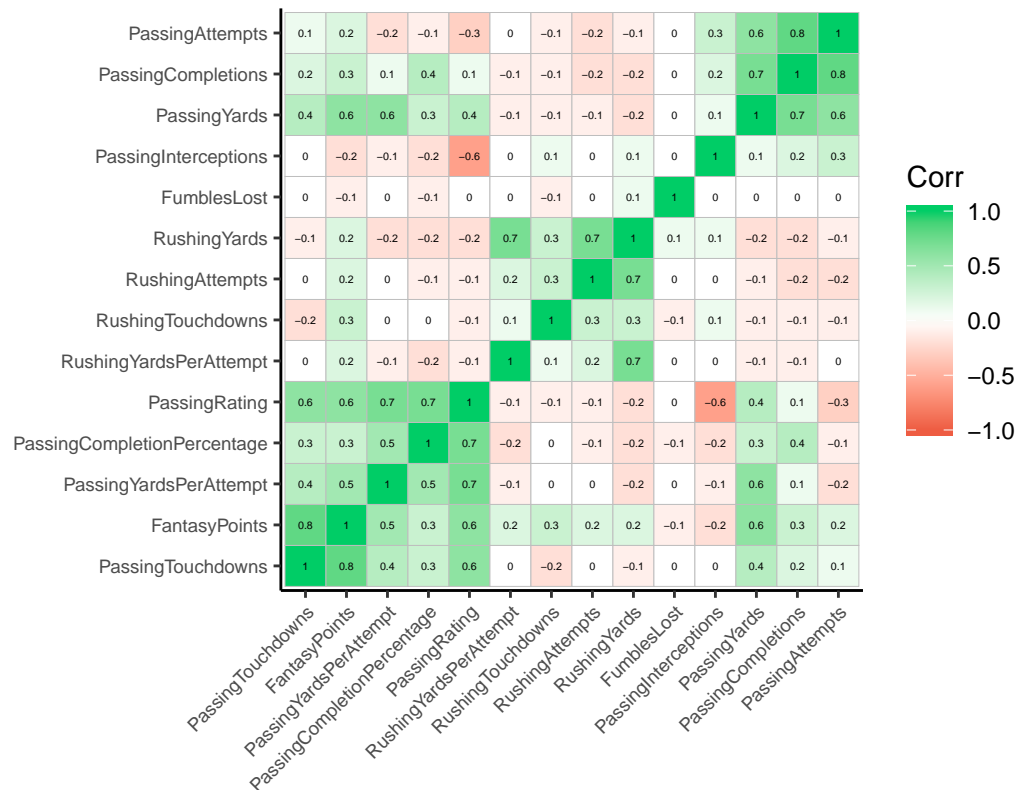
### 1.4.2 Corrrrelogram Style2 QBData (Old dataset)

```
#corrplot(corr, method="circle",tl.cex = 0.55,tl.col = "#1C1C1C")
```

### 1.4.3 Corrrrelogram of Crosssectional data (New dataset)

```
QBX_ds <- QBCrossSectional[-c(1:6,21)]
corr <- round(cor(QBX_ds), 1)
ggcorrplot(corr, hc.order = TRUE,
           type = "full",
           lab = TRUE,
           lab_size = 1.5,
           method="square",
           colors = c("tomato2", "white", "springgreen3"),
           title="Correlogram of Quarterbacks", tl.cex = 7,pch=2,pch.col =3,show.diag = T,
           ggtheme=theme_classic)
```

## Correlogram of Quarterbacks

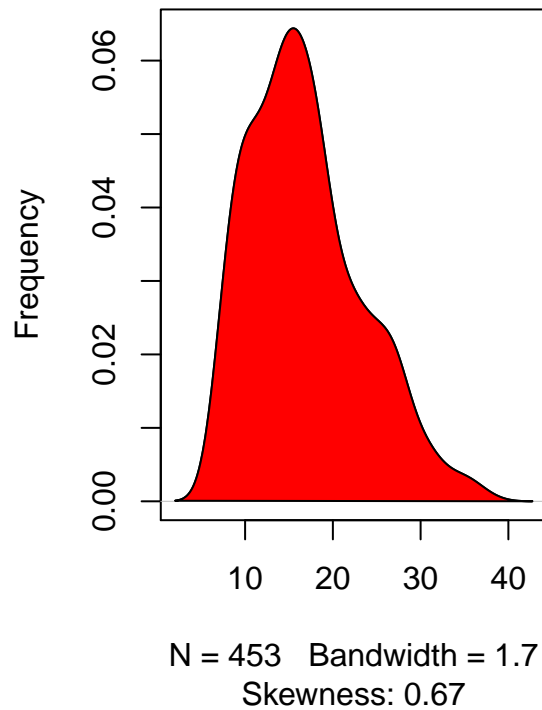


## 1.5: Distributions

### 1.5.1 Density plot for FantasyPoints is approximately Normal (Old QBData)

```
library(e1071)
par(mfrow=c(1, 2)) # divide graph area in 2 columns
target <- QBCrossSectional$FantasyPoints
plot(density(target), main="QBdata: FantasyPoints", ylab="Frequency", sub=paste("Skewness:", round(e1071::skewness(target), 2)))
polygon(density(target), col="red", asp=1.2 )
```

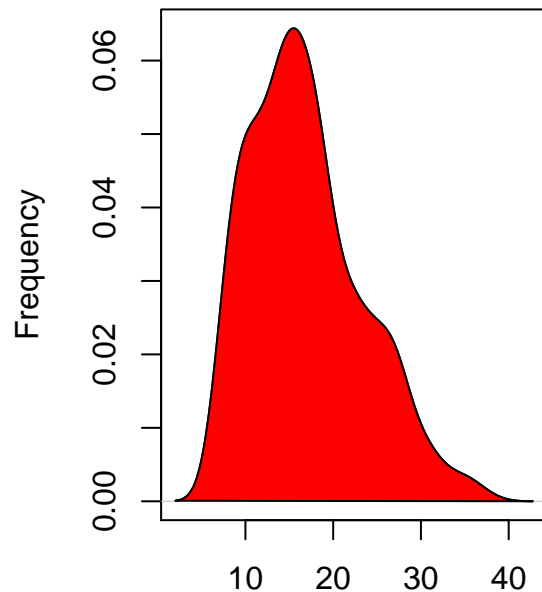
### QBdata: FantasyPoints



1.5.2 Density plot for Fantasypoints is approxmiately Normal (New QBCrossSectional)

```
par(mfrow=c(1, 2)) # divide graph area in 2 columns
target <- QBCrossSectional$FantasyPoints
plot(density(target), main="CrossSectional Dataset: FantasyPoints", ylab="Frequency", sub=paste("Skewness: 0.67"))
polygon(density(target), col="red")
```

## CrossSectional Dataset: FantasyPo

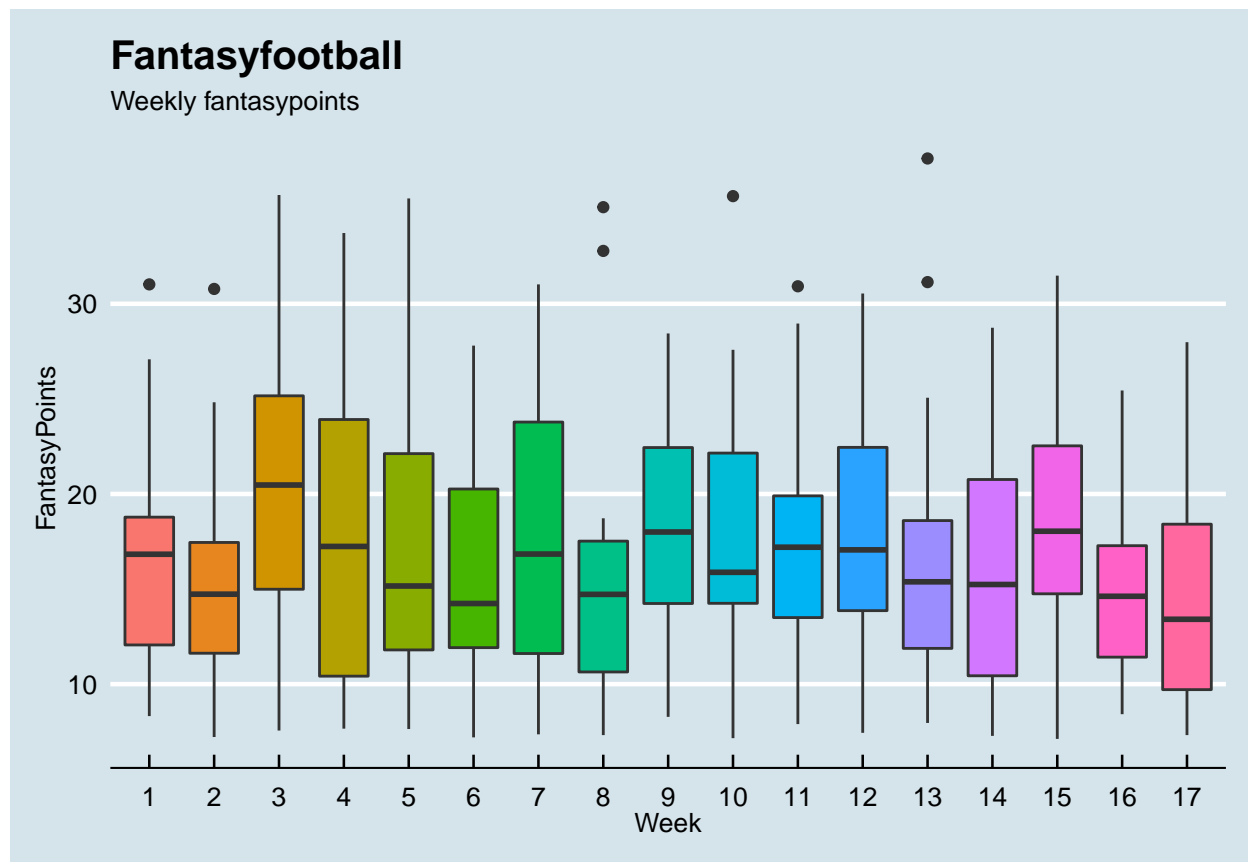


N = 453 Bandwidth = 1.7  
Skewness: 0.67

### 1.5.3 Boxplots - Target and Individual Predictor Behavior for per Team

I think we should do these by week - not team - we want to look at variance of the time series across observations

```
QBCrossSectional %>% ggplot(aes(y=FantasyPoints,x=Week,fill=Week,group=Week))+  
  geom_boxplot(show.legend = FALSE)+  
  xlab("Week")+ylab("FantasyPoints")+  
  labs(title="Fantasyfootball",  
        subtitle="Weekly fantasypoints",  
        aption="Source: Fantasyfootball")+theme_economist()
```



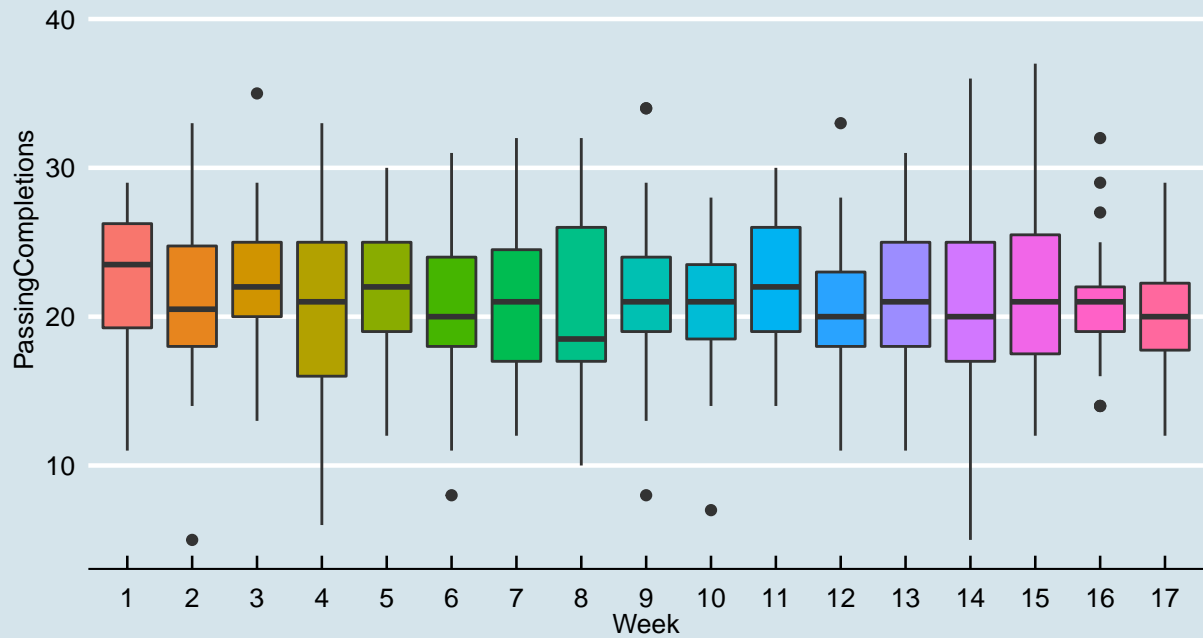
```
for (i in 7:19) {

ggplotp <- QBCrossSectional %>% ggplot(aes_string(y=names(QBCrossSectional[i]),x=Week,fill=Week,group=W
      geom_boxplot(show.legend = FALSE)+
      xlab("Week")+ylab(names(QBCrossSectional[i]))+
      labs(title="Fantasyfootball",
            subtitle="Weekly fantasypoints",
            caption="Source: Fantasyfootball")+theme_economist()

      print(ggplotp)
}
```

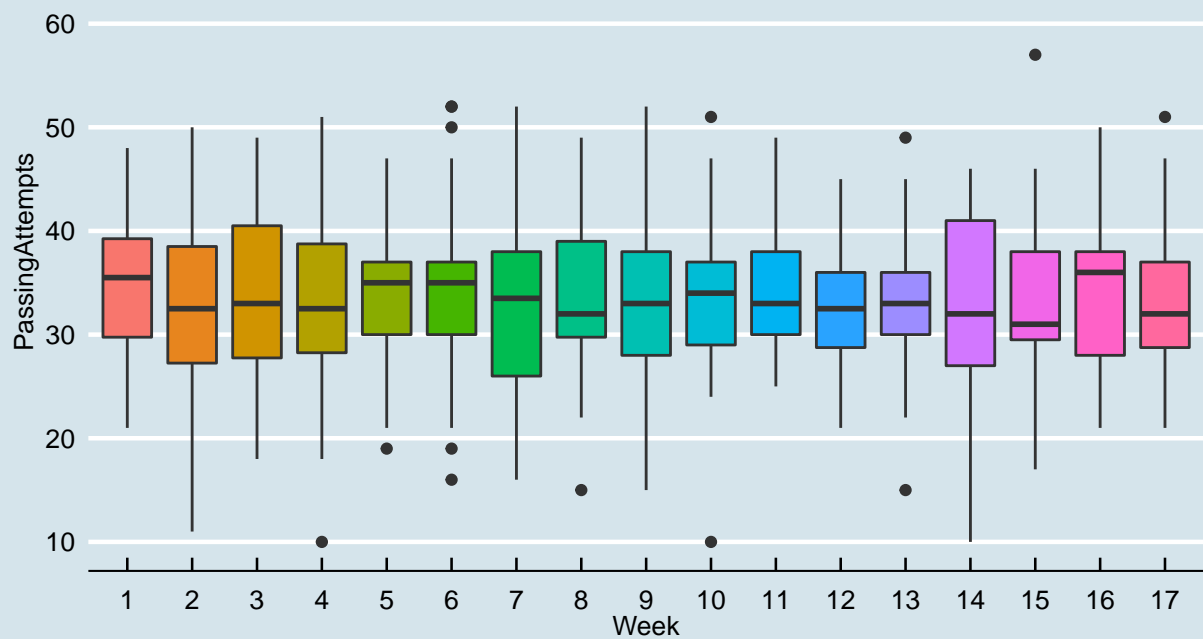
## Fantasyfootball

Weekly fantasypoints



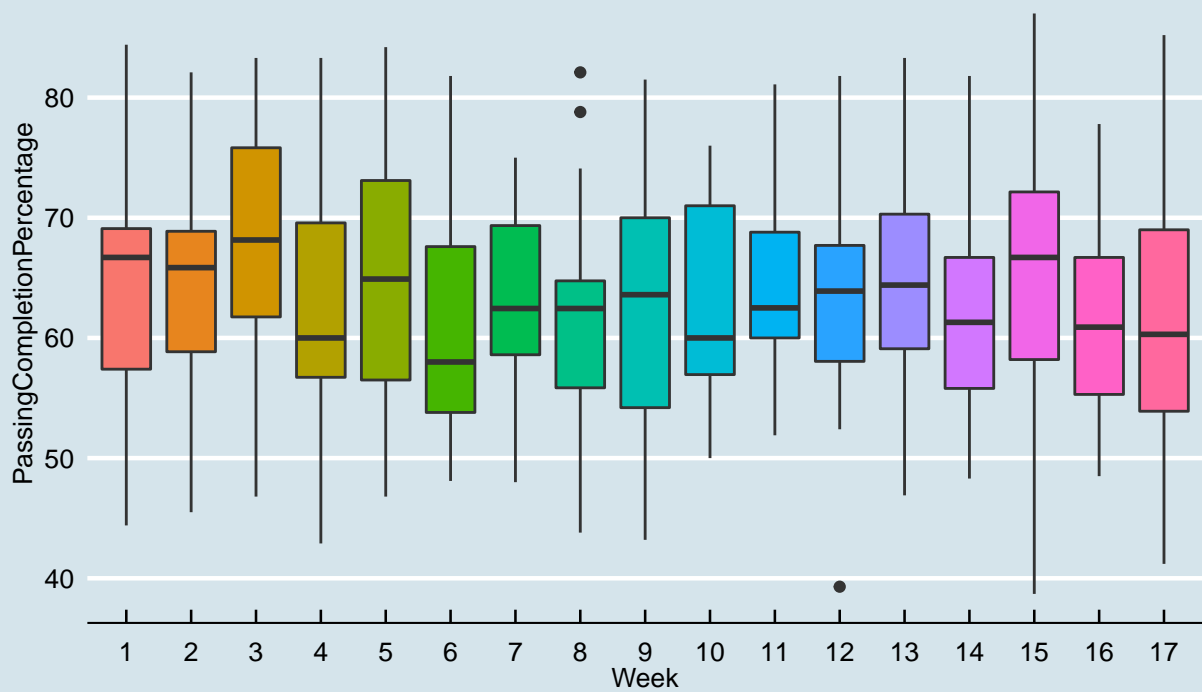
## Fantasyfootball

Weekly fantasypoints



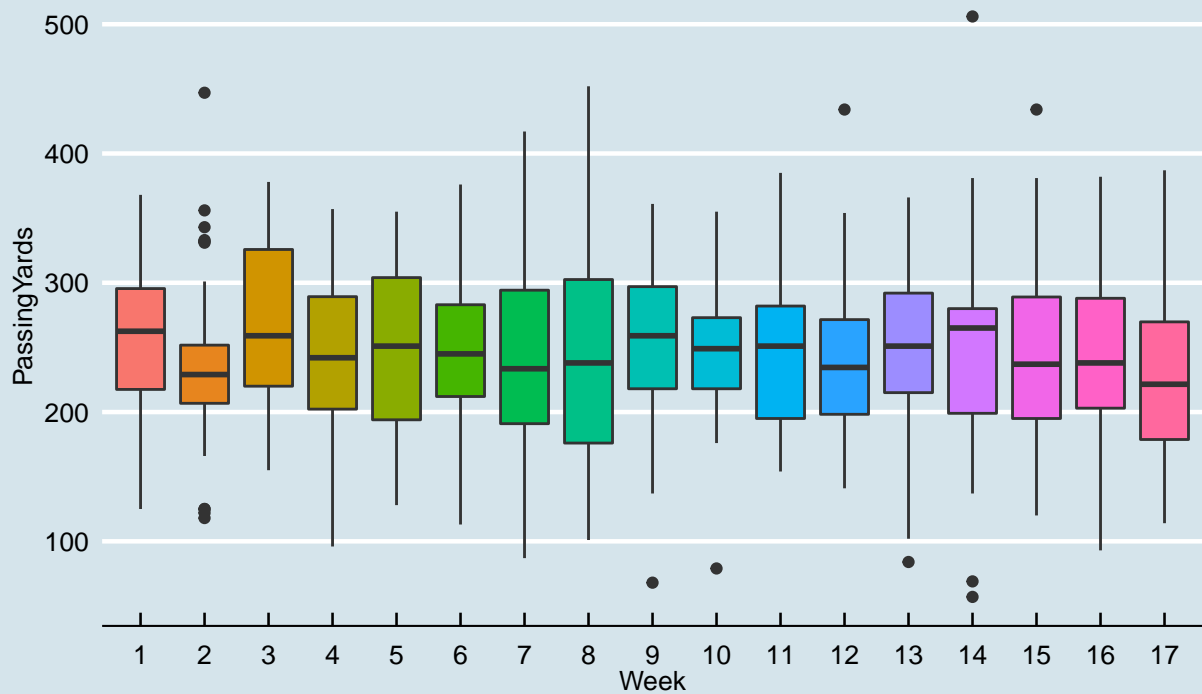
## Fantasyfootball

Weekly fantasypoints



## Fantasyfootball

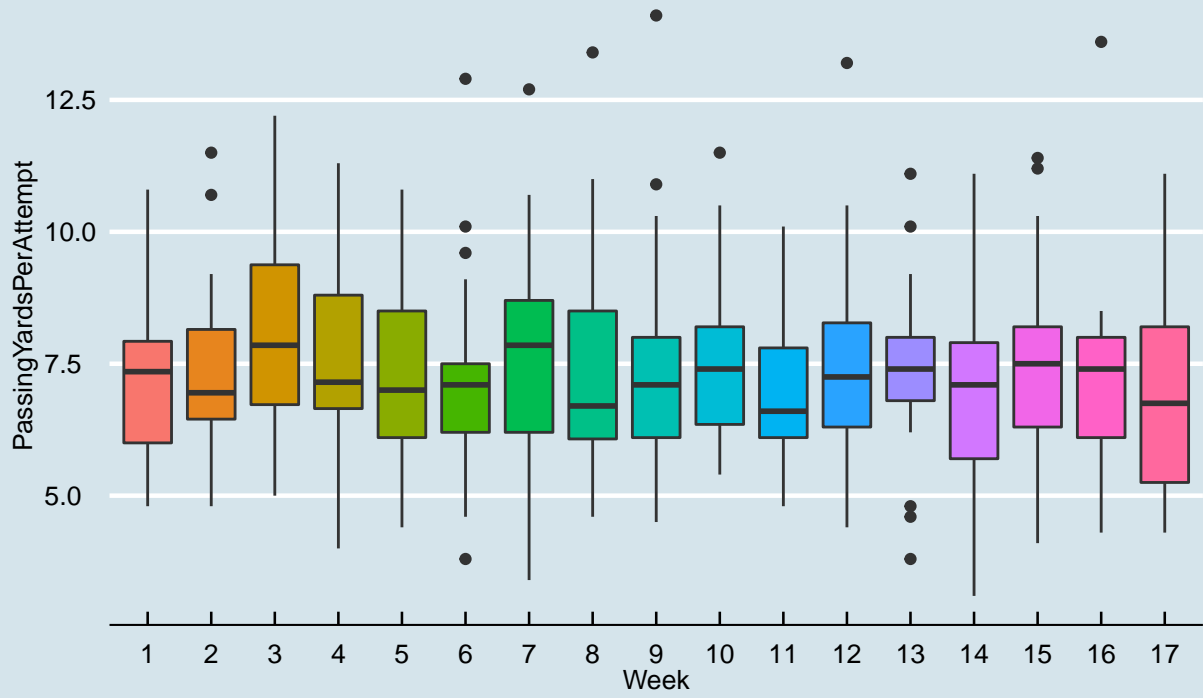
Weekly fantasypoints





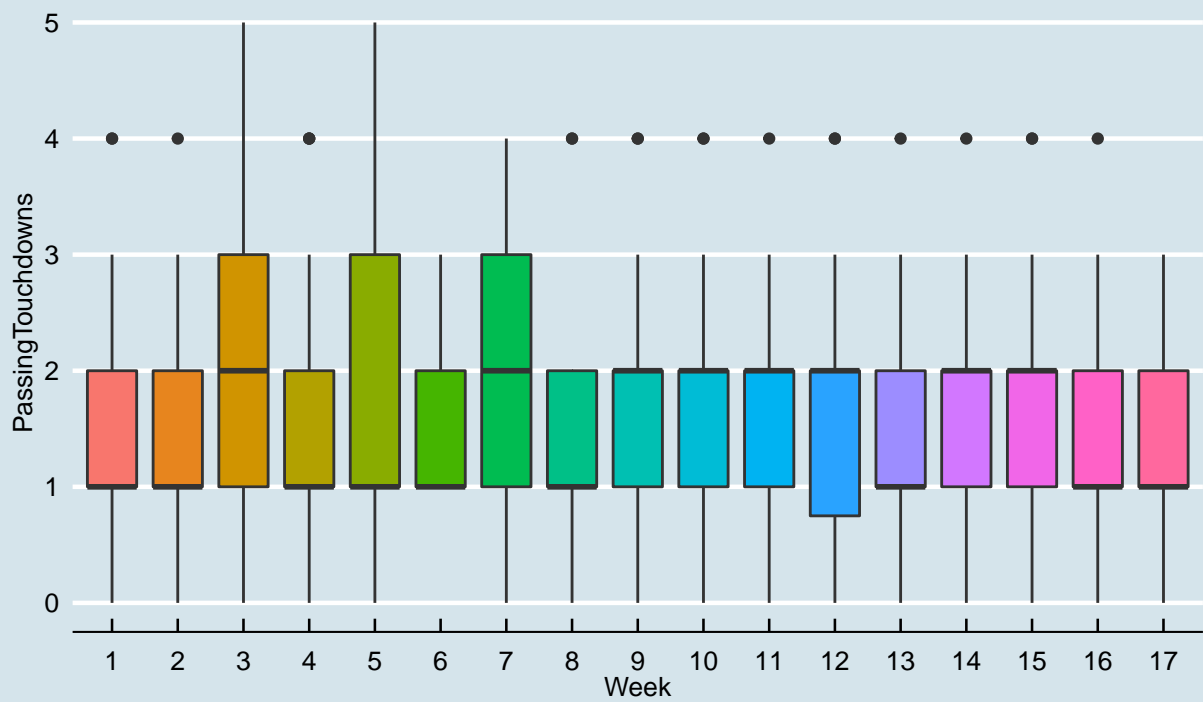
## Fantasyfootball

Weekly fantasypoints



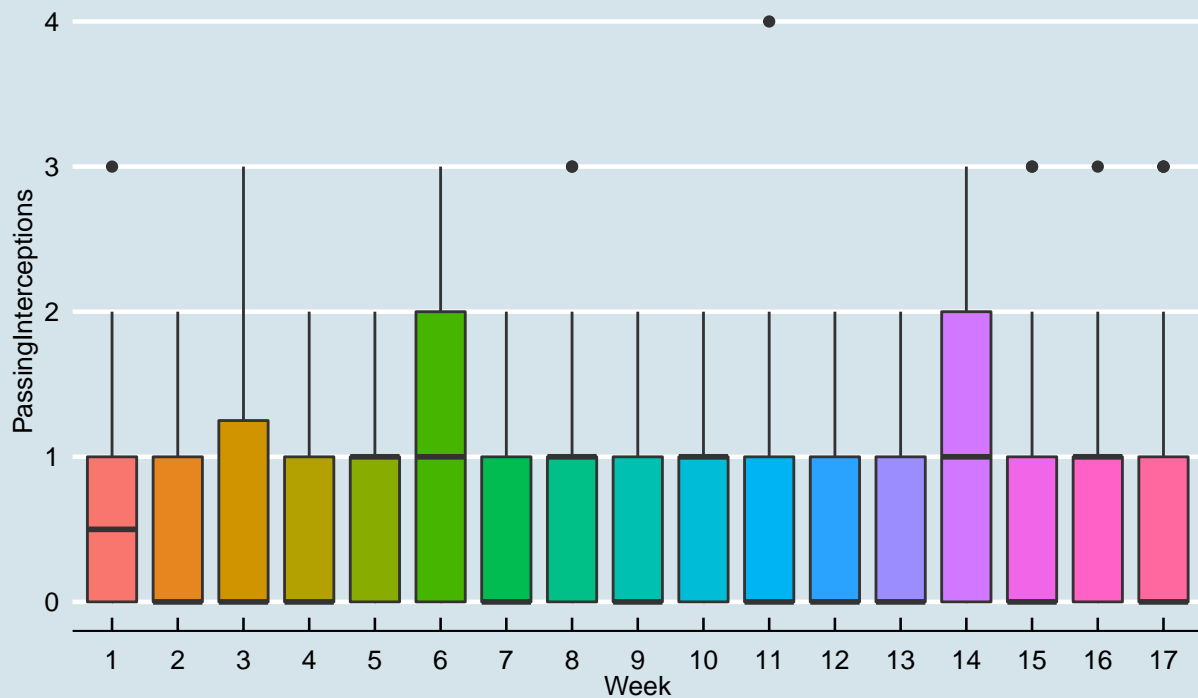
## Fantasyfootball

Weekly fantasypoints



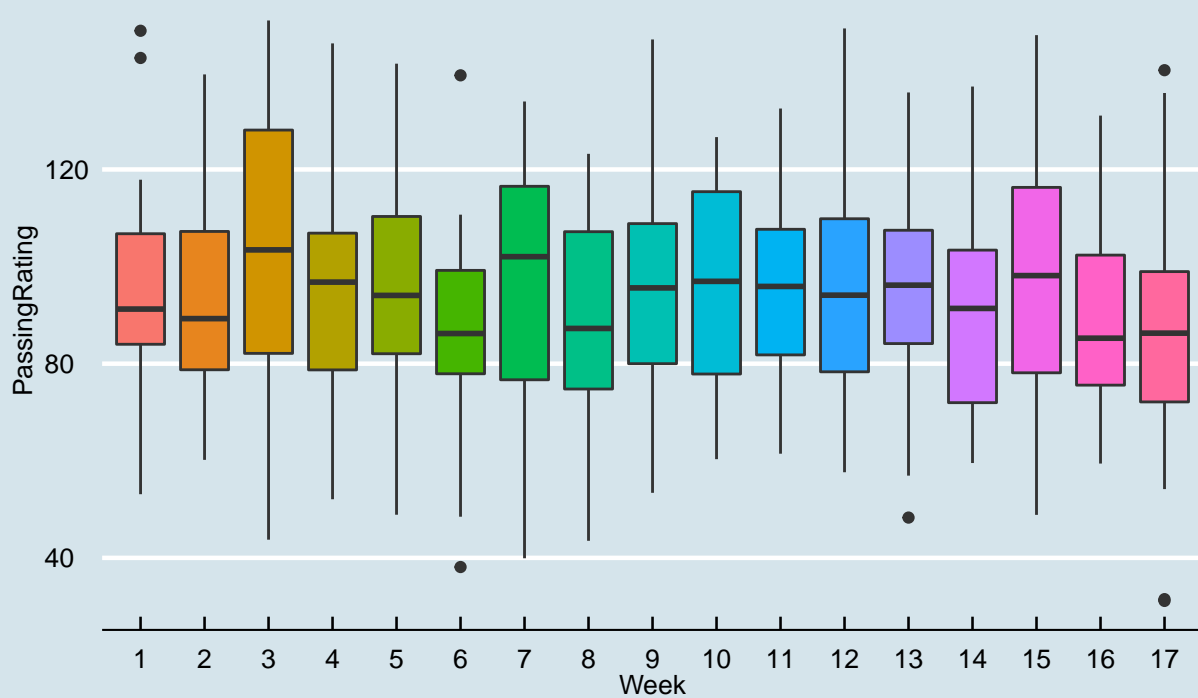
## Fantasyfootball

Weekly fantasypoints



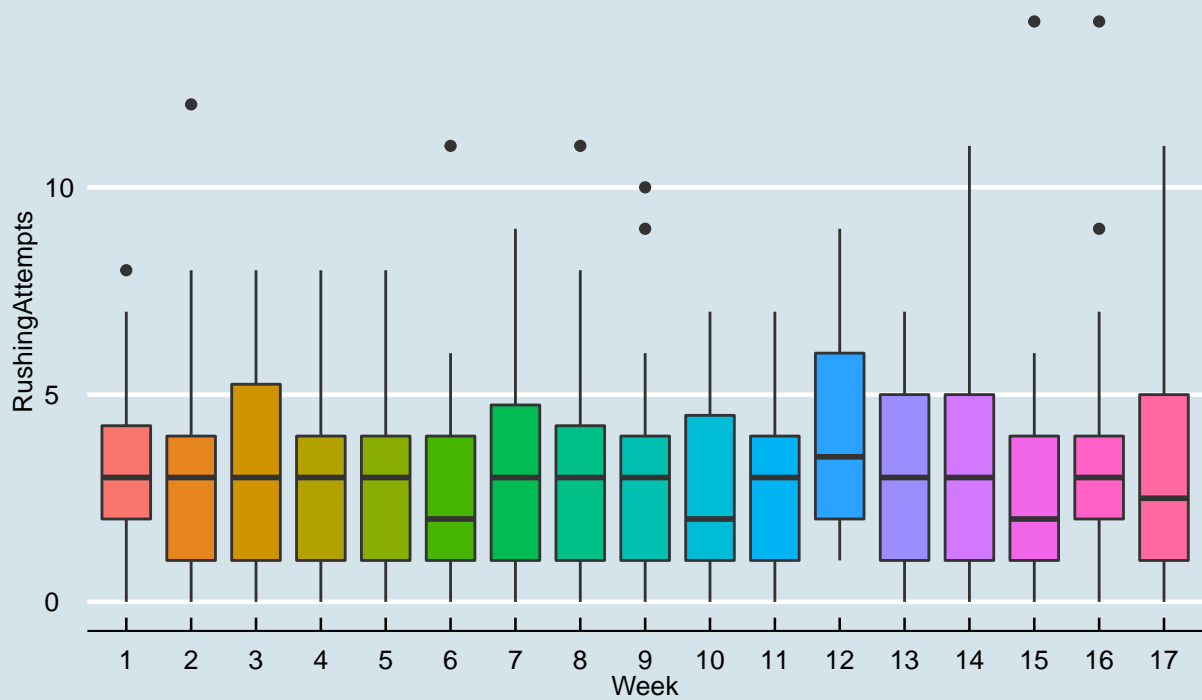
## Fantasyfootball

Weekly fantasypoints



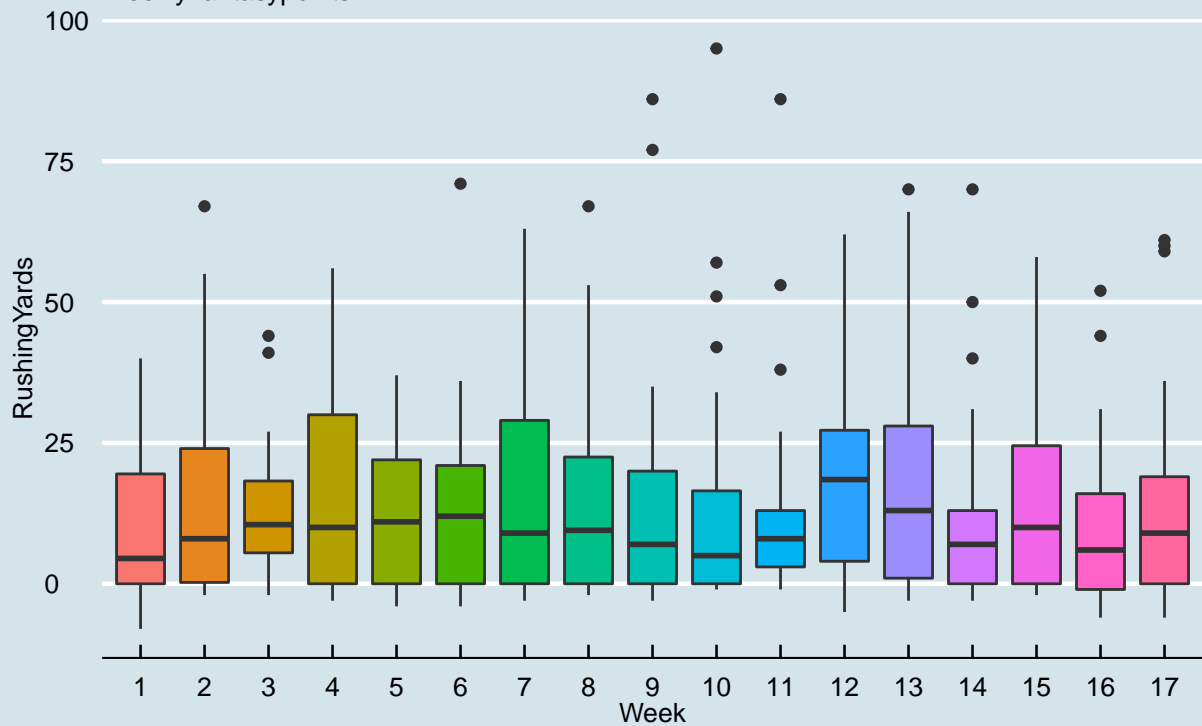
## Fantasyfootball

Weekly fantasypoints



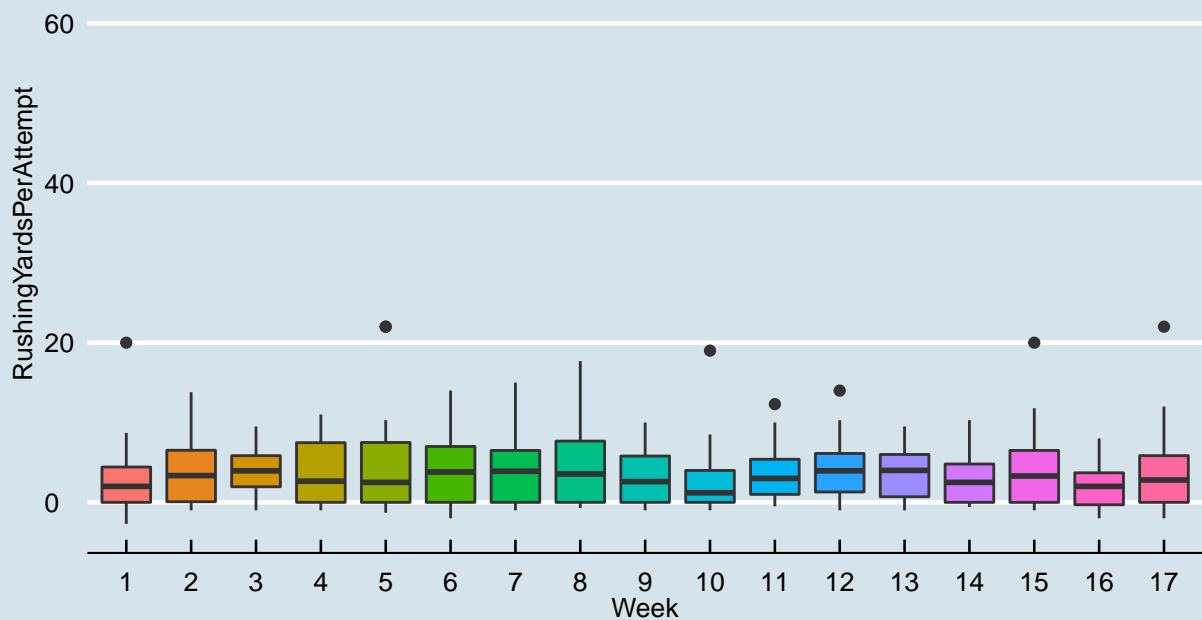
## Fantasyfootball

Weekly fantasypoints



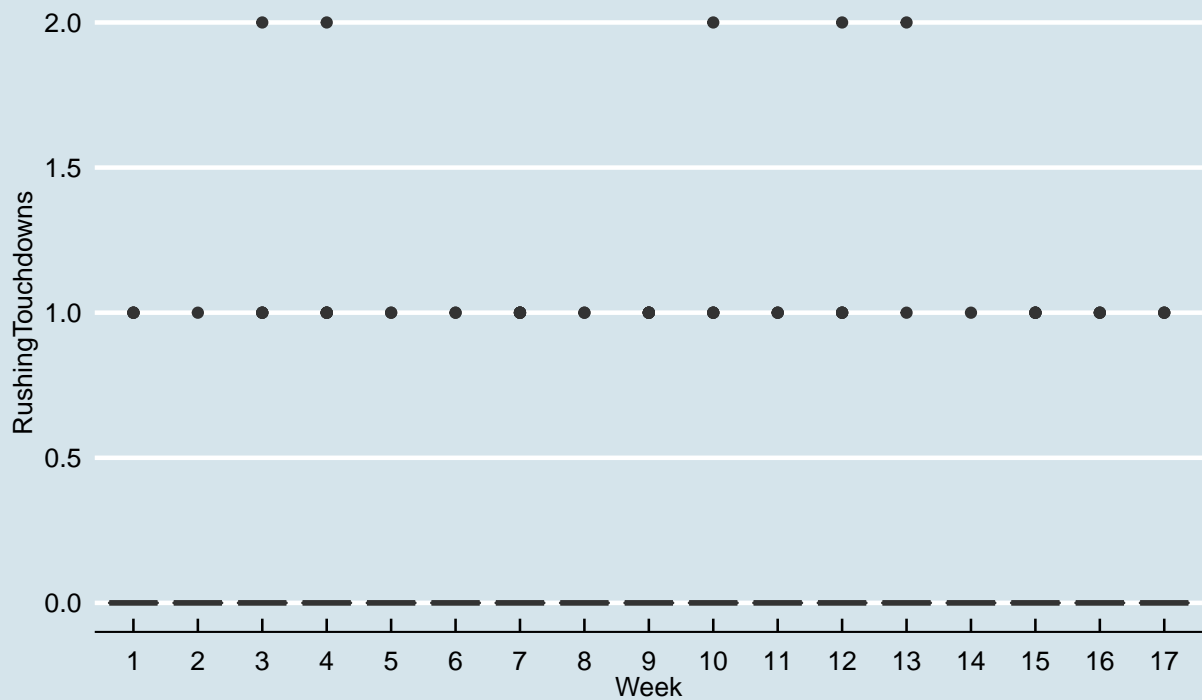
## Fantasyfootball

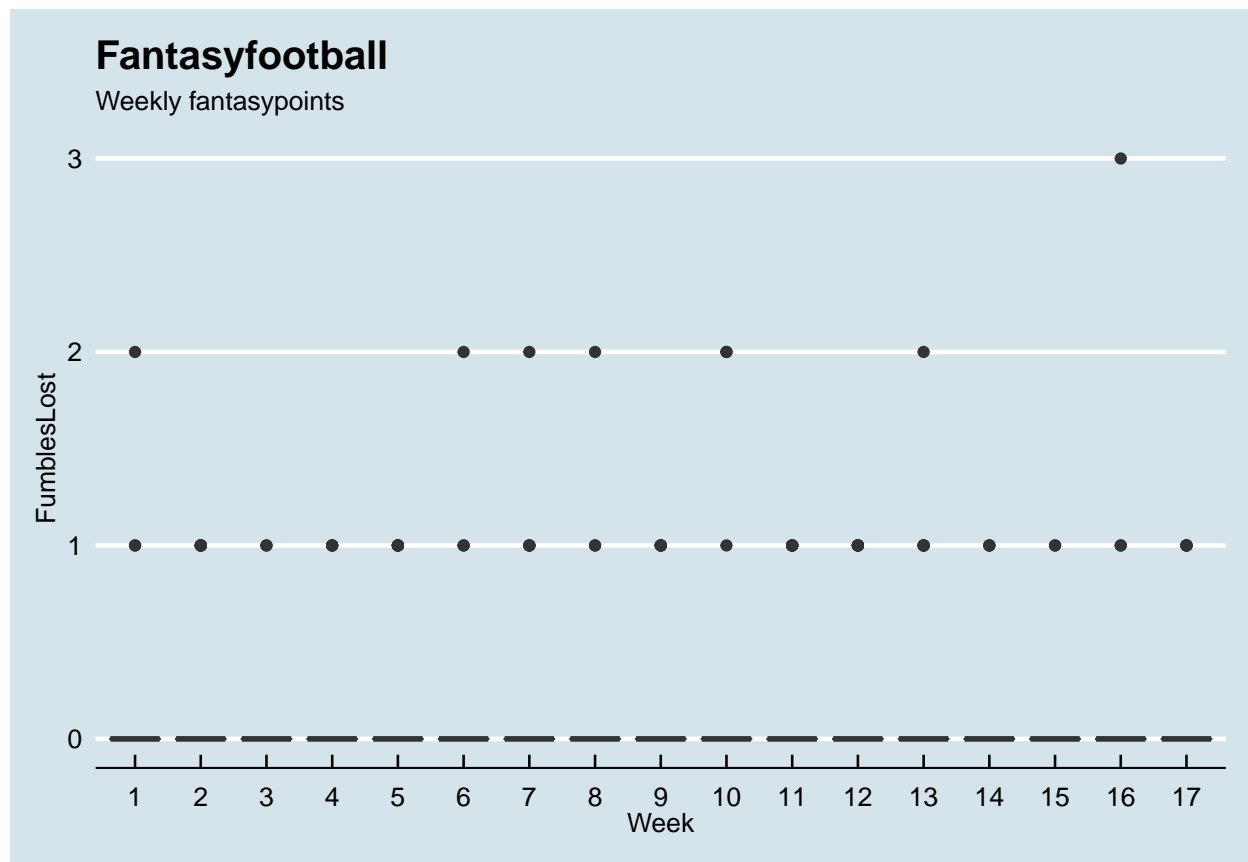
Weekly fantasypoints



## Fantasyfootball

Weekly fantasypoints



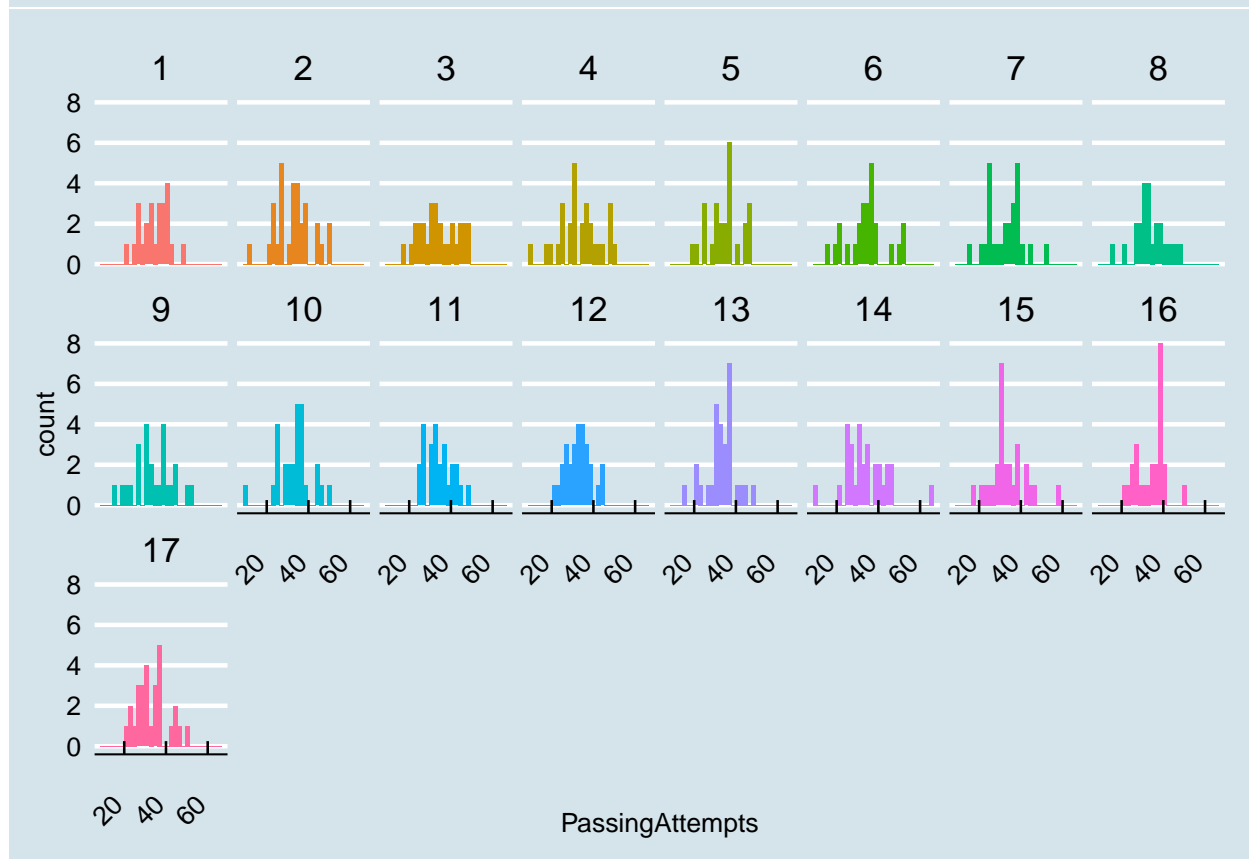
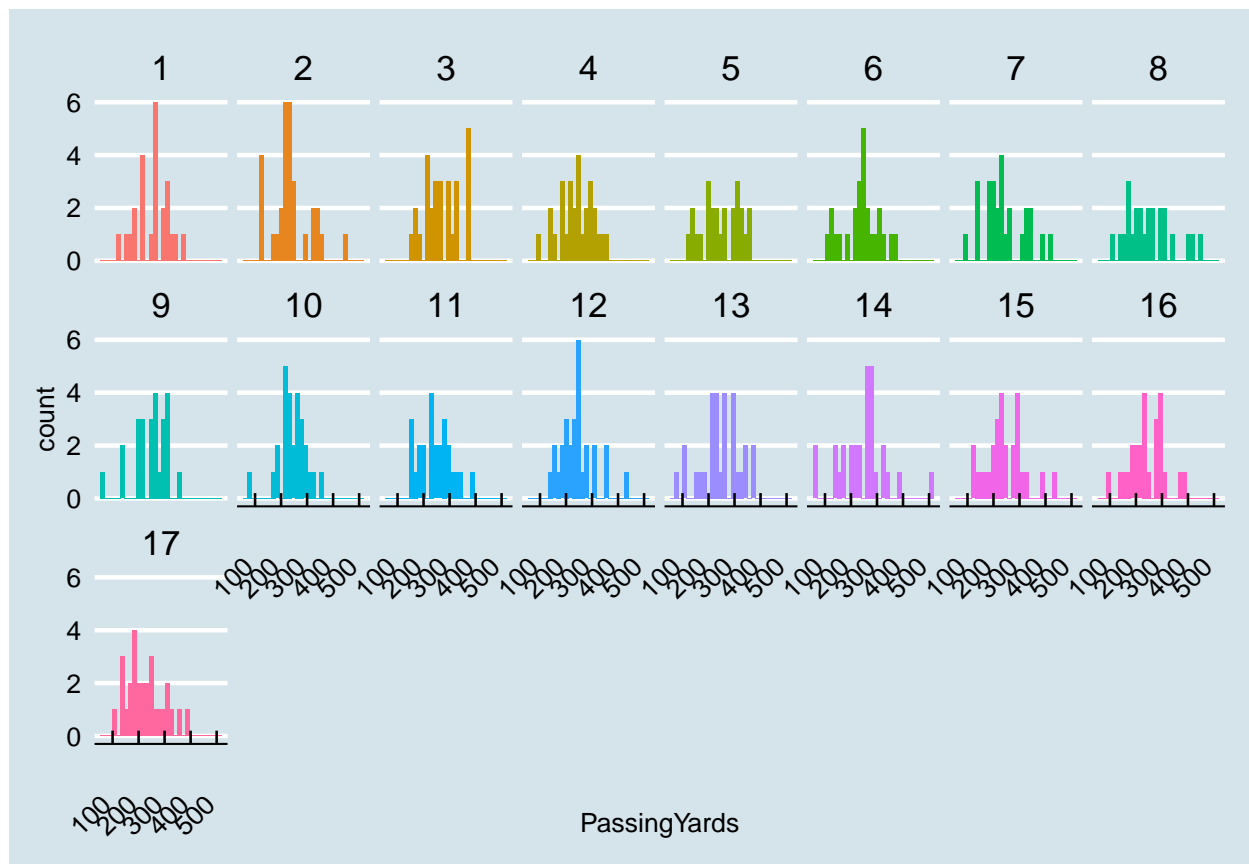


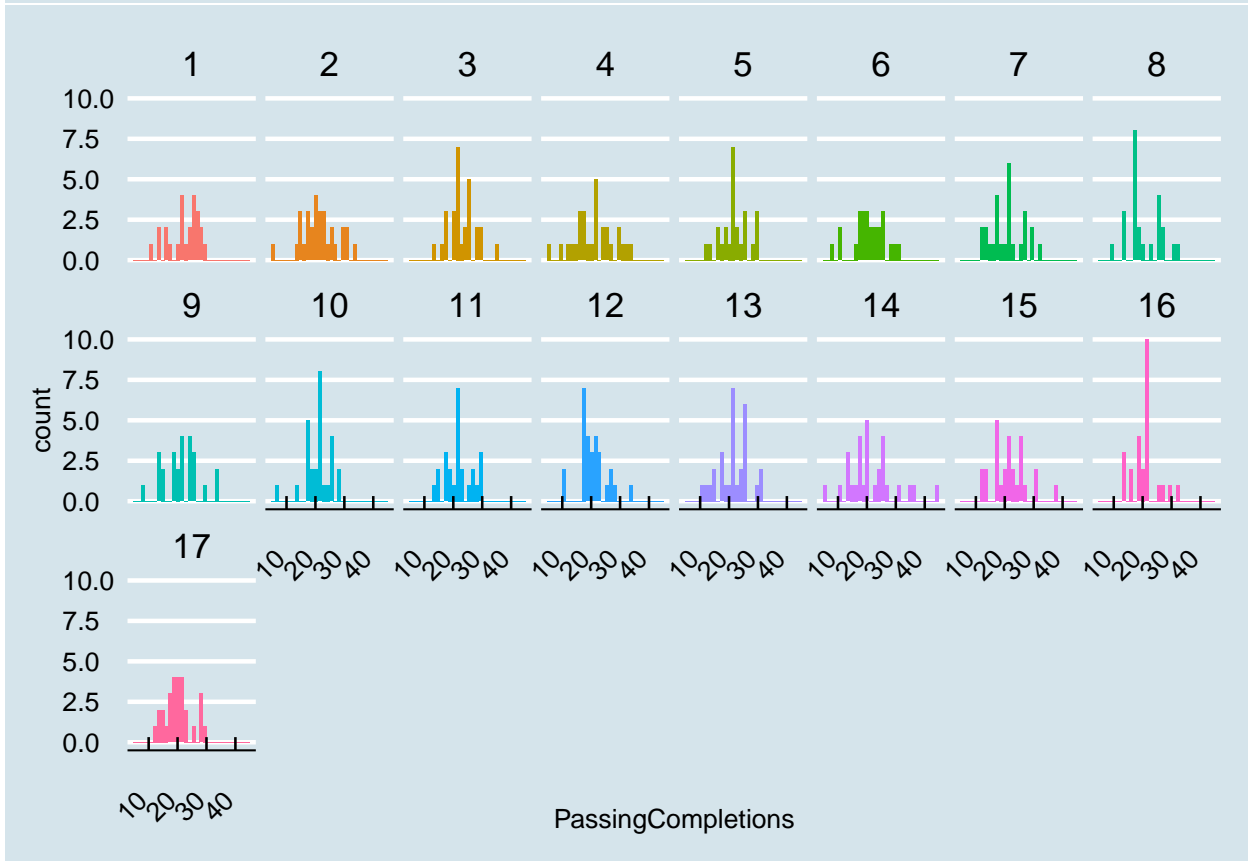
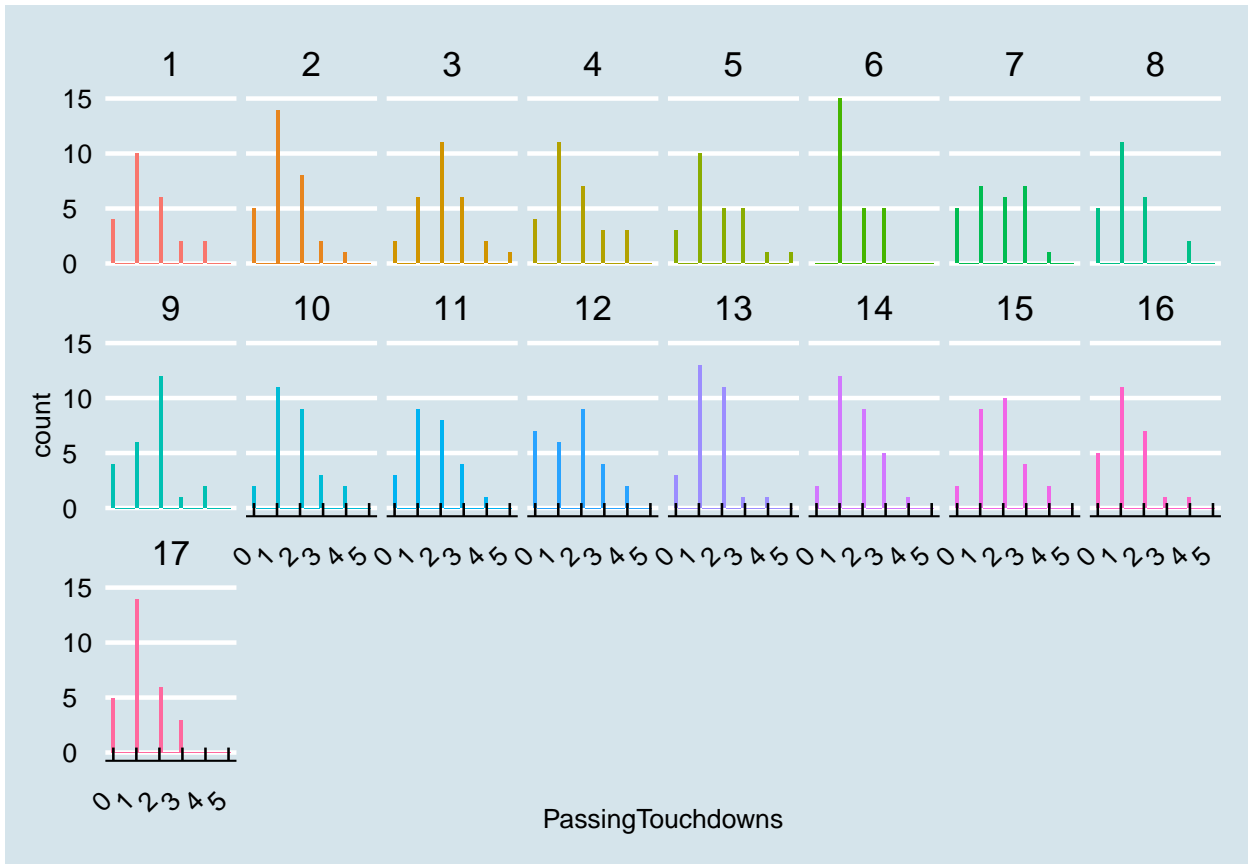
## Check for skewed predictors

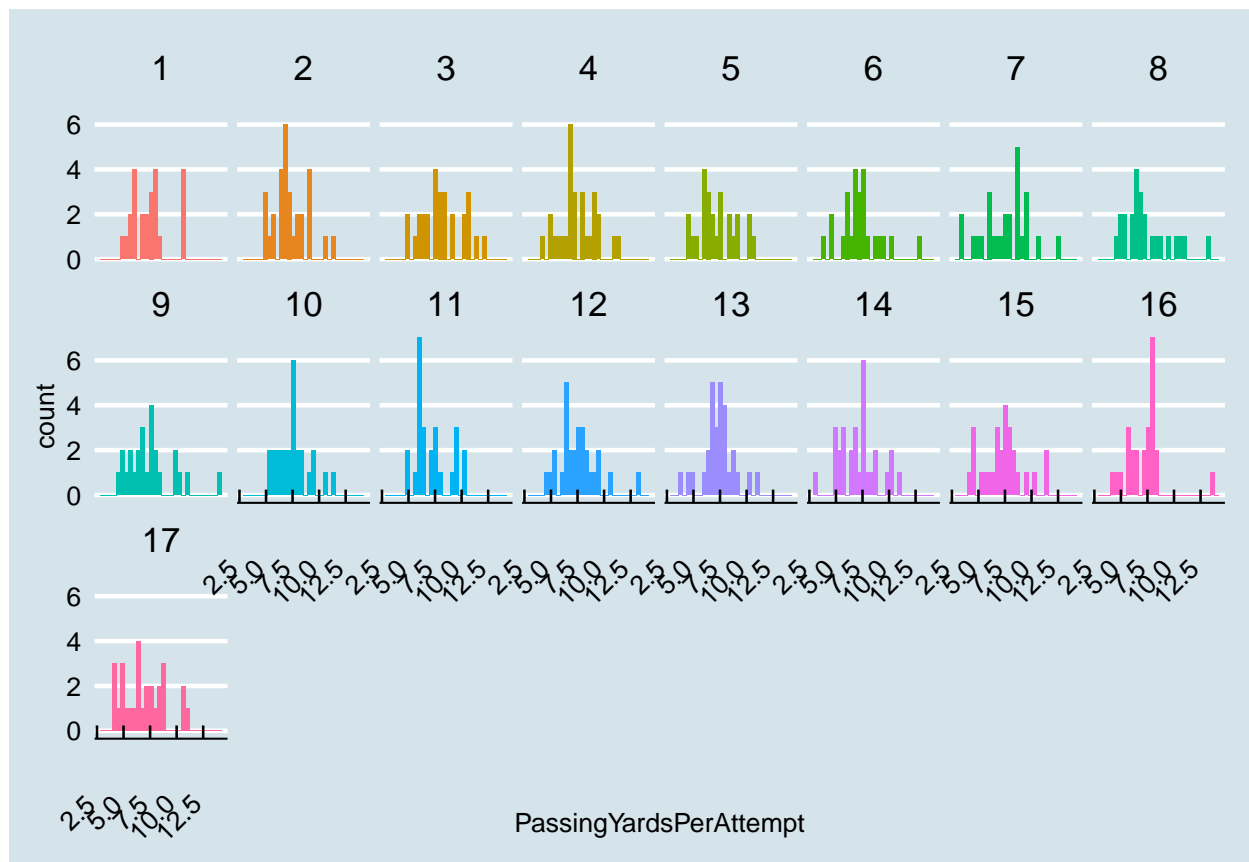
### 1.5.4 Histograms - Normality by Week

```
features_to_keep = c('PassingYards', 'PassingAttempts', 'PassingTouchdowns', 'PassingCompletions', 'PassingInterceptions')
for(f in features_to_keep){
  hist = QBCrossSectional %>% ggplot(aes_string(x=f))+
    geom_histogram(bins=30,aes(fill=Week),show.legend = FALSE)+
    facet_wrap(~Week,ncol=8)+theme_economist()+theme(axis.text.x = element_text(angle=45))

  print(hist)
}
```







## 1.6: Relationships

### 1.6.1 Relationship between FantasyPoints with all predictors and taking Opponent into consideration

Not sure that combining these is useful

```
attach(QBCrossSectional)
```

```
## The following objects are masked from QBCrossSectional (pos = 4):
```

```
##
```

```
## FantasyPoints, FumblesLost, GameDate, Opponent,
## PassingAttempts, PassingCompletionPercentage,
## PassingCompletions, PassingInterceptions, PassingRating,
## PassingTouchdowns, PassingYards, PassingYardsPerAttempt,
## PlayerID, Position, RushingAttempts, RushingTouchdowns,
## RushingYards, RushingYardsPerAttempt, Team, TeamIsHome, Week
```

```
## The following object is masked from package:ggplot2:
```

```
##
```

```
## Position
```

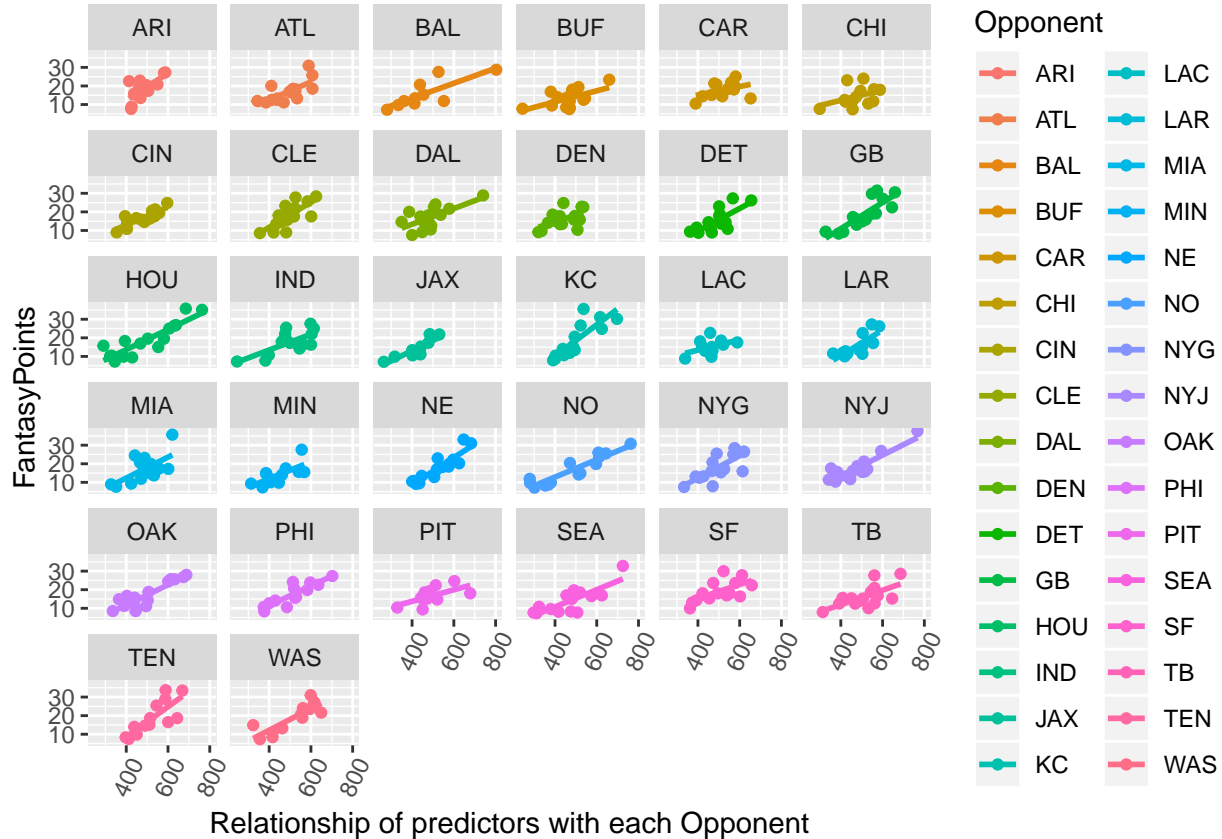
```
QBCrossSectional %>% ggplot(aes(y=FantasyPoints,x=PassingCompletions+PassingAttempts+
PassingCompletionPercentage+
PassingYards+PassingYardsPerAttempt+
PassingTouchdowns+PassingInterceptions+
PassingRating+RushingAttempts+RushingYards+
RushingYardsPerAttempt+RushingTouchdowns+FumblesLost,
```



```

        color=Opponent))+
  xlab("Relationship of predictors with each Opponent")+
  geom_point()+
  geom_smooth(method="lm",se=F)+
  theme(axis.text.x = element_text(angle=65, vjust=0.6))+facet_wrap(~Opponent)

```



### 1.6.2 Relationship between FanatasyPoints with all predictors and taking Home turf into consideration

Same here....

```
attach(QBCrossSectional)
```

```

## The following objects are masked from QBCrossSectional (pos = 3):
##
##   FantasyPoints, FumblesLost, GameDate, Opponent,
##   PassingAttempts, PassingCompletionPercentage,
##   PassingCompletions, PassingInterceptions, PassingRating,
##   PassingTouchdowns, PassingYards, PassingYardsPerAttempt,
##   PlayerID, Position, RushingAttempts, RushingTouchdowns,
##   RushingYards, RushingYardsPerAttempt, Team, TeamIsHome, Week
##
## The following objects are masked from QBCrossSectional (pos = 5):
##
##   FantasyPoints, FumblesLost, GameDate, Opponent,
##   PassingAttempts, PassingCompletionPercentage,
##   PassingCompletions, PassingInterceptions, PassingRating,
##   PassingTouchdowns, PassingYards, PassingYardsPerAttempt,

```

```
## PlayerID, Position, RushingAttempts, RushingTouchdowns,
## RushingYards, RushingYardsPerAttempt, Team, TeamIsHome, Week

## The following object is masked from package:ggplot2:
##
## Position

QBCrossSectional %>% ggplot(aes(y=FantasyPoints,x=PassingCompletions+PassingAttempts+
    PassingCompletionPercentage+
    PassingYards+PassingYardsPerAttempt+
    PassingTouchdowns+PassingInterceptions+
    PassingRating+RushingAttempts+RushingYards+
    RushingYardsPerAttempt+RushingTouchdowns+FumblesLost,
    color=TeamIsHome))+

    geom_point()+
    geom_smooth(method="lm",se=F)+
    theme(axis.text.x = element_text(angle=65, vjust=0.6))+facet_wrap(~TeamIsHome)
```



### 1.6.3 Relationship between FanatasyPoints with all predictors per team

and here.....

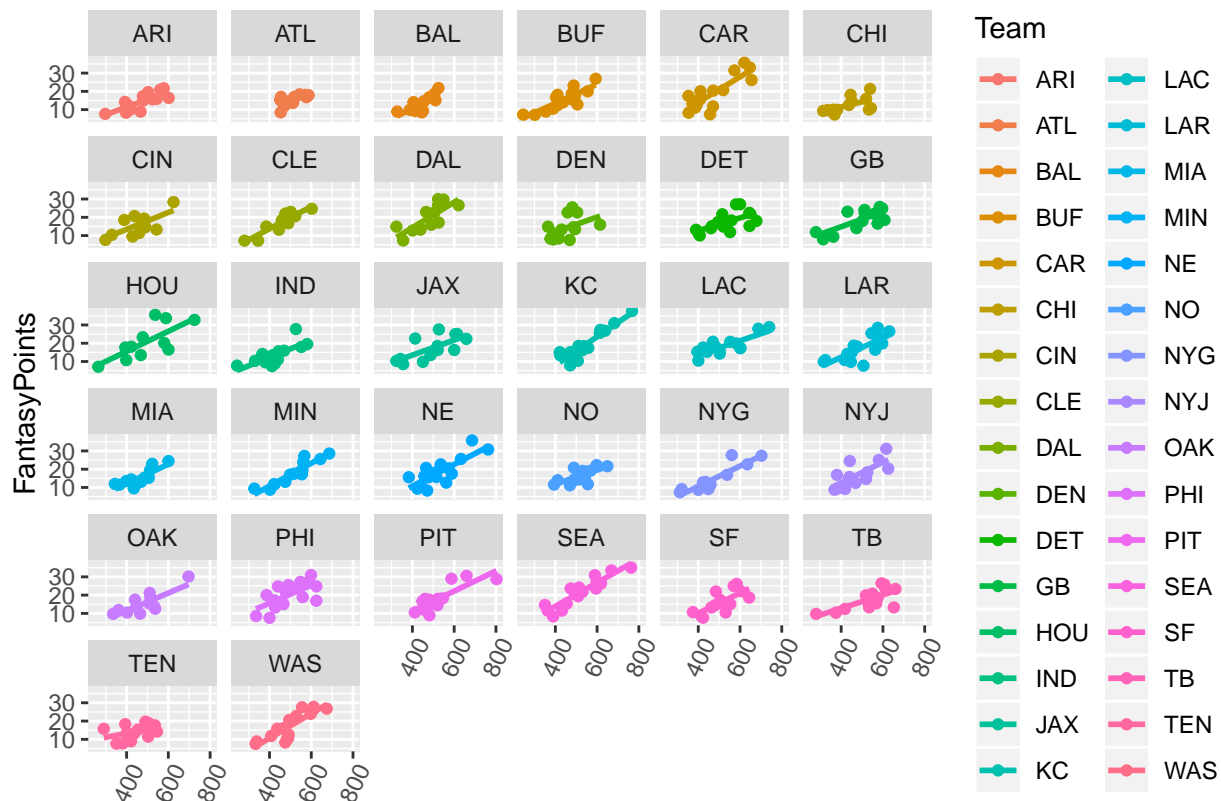
```
attach(QBCrossSectional)
```

```
## The following objects are masked from QBCrossSectional (pos = 3):
##
## FantasyPoints, FumblesLost, GameDate, Opponent,
## PassingAttempts, PassingCompletionPercentage,
## PassingCompletions, PassingInterceptions, PassingRating,
```

```

##      PassingTouchdowns, PassingYards, PassingYardsPerAttempt,
##      PlayerID, Position, RushingAttempts, RushingTouchdowns,
##      RushingYards, RushingYardsPerAttempt, Team, TeamIsHome, Week
## The following objects are masked from QBCrossSectional (pos = 4):
##
##      FantasyPoints, FumblesLost, GameDate, Opponent,
##      PassingAttempts, PassingCompletionPercentage,
##      PassingCompletions, PassingInterceptions, PassingRating,
##      PassingTouchdowns, PassingYards, PassingYardsPerAttempt,
##      PlayerID, Position, RushingAttempts, RushingTouchdowns,
##      RushingYards, RushingYardsPerAttempt, Team, TeamIsHome, Week
## The following objects are masked from QBCrossSectional (pos = 6):
##
##      FantasyPoints, FumblesLost, GameDate, Opponent,
##      PassingAttempts, PassingCompletionPercentage,
##      PassingCompletions, PassingInterceptions, PassingRating,
##      PassingTouchdowns, PassingYards, PassingYardsPerAttempt,
##      PlayerID, Position, RushingAttempts, RushingTouchdowns,
##      RushingYards, RushingYardsPerAttempt, Team, TeamIsHome, Week
## The following object is masked from package:ggplot2:
##
##      Position
QBCrossSectional %>% ggplot(aes(y=FantasyPoints,x=PassingCompletions+PassingAttempts+
                                PassingCompletionPercentage+
                                PassingYards+PassingYardsPerAttempt+
                                PassingTouchdowns+PassingInterceptions+
                                PassingRating+RushingAttempts+
                                RushingYards+RushingYardsPerAttempt+
                                RushingTouchdowns+FumblesLost,color=Team)) +
  geom_point()+
  geom_smooth(method="lm",se=F)+
  theme(axis.text.x = element_text(angle=65, vjust=0.6))+facet_wrap(~Team)

```

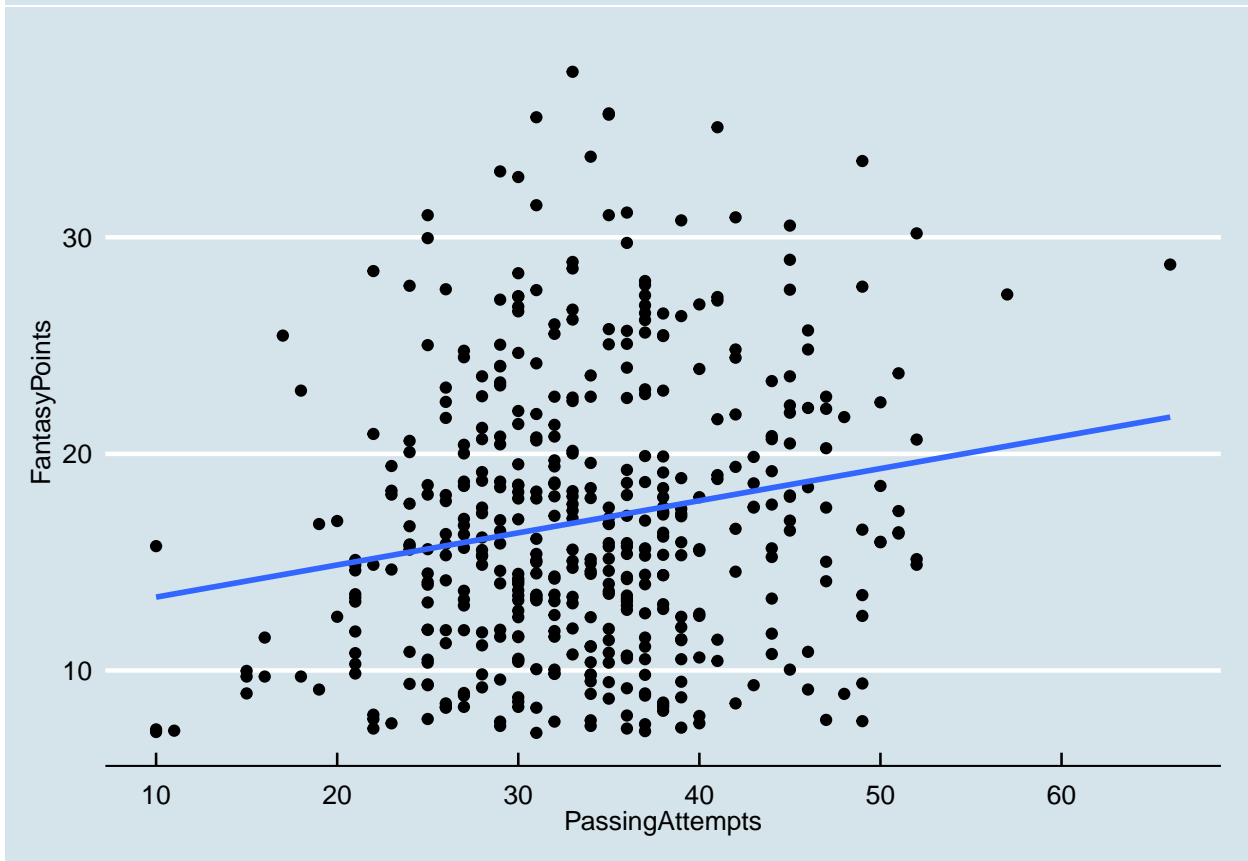
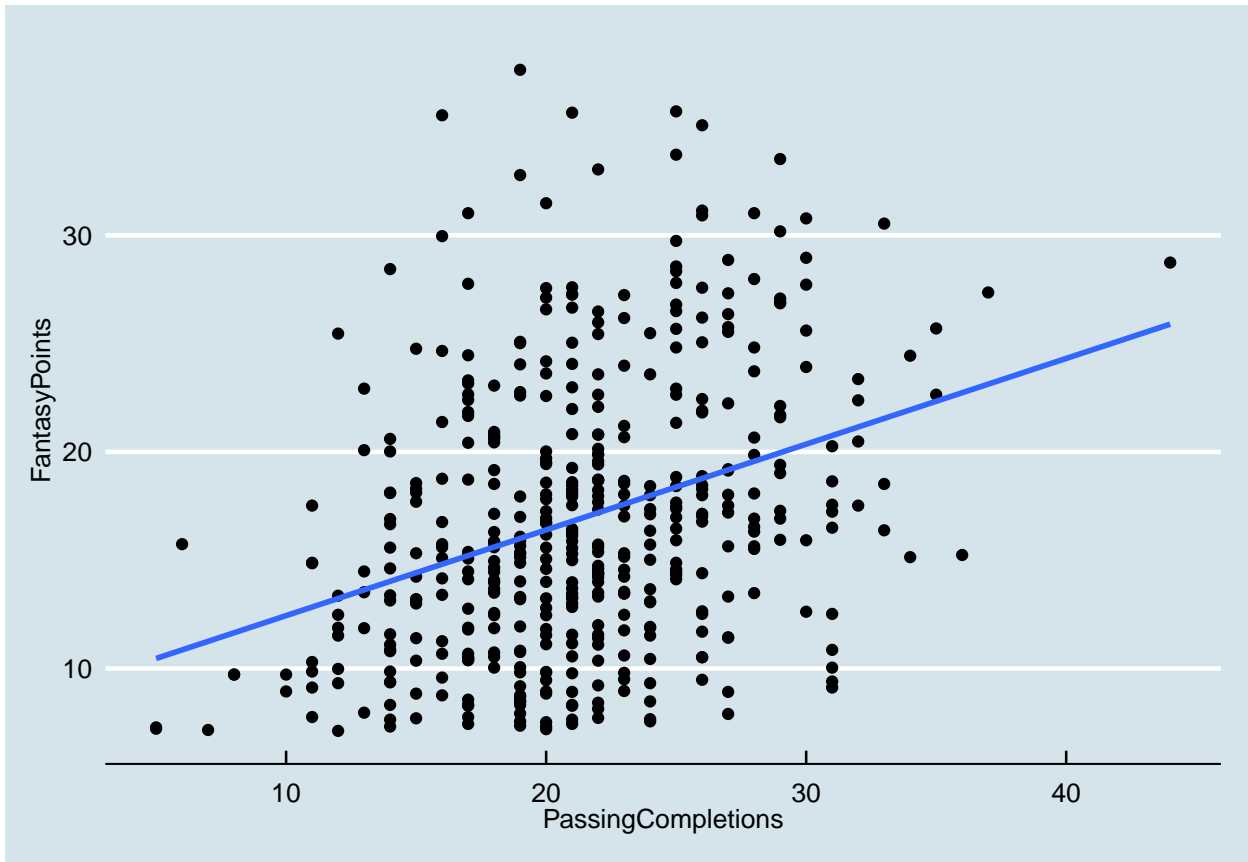


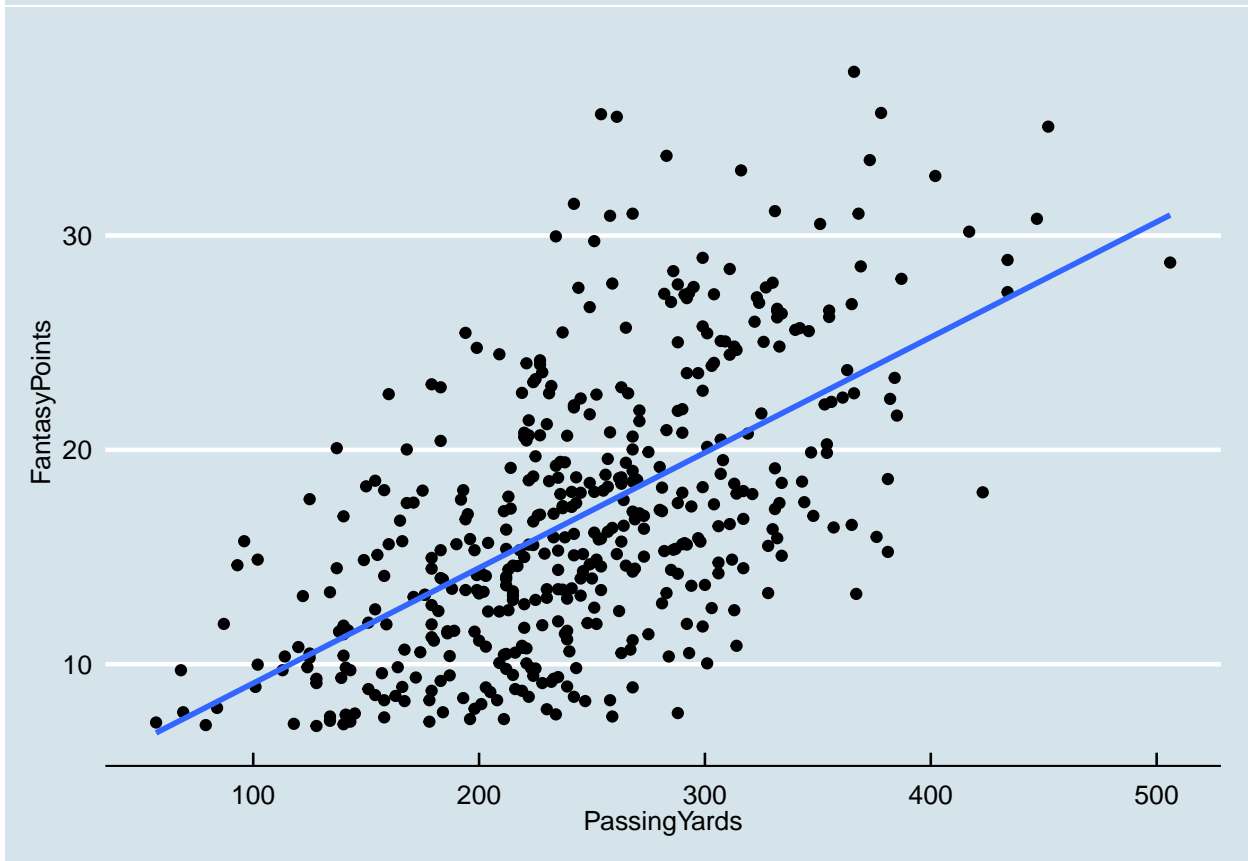
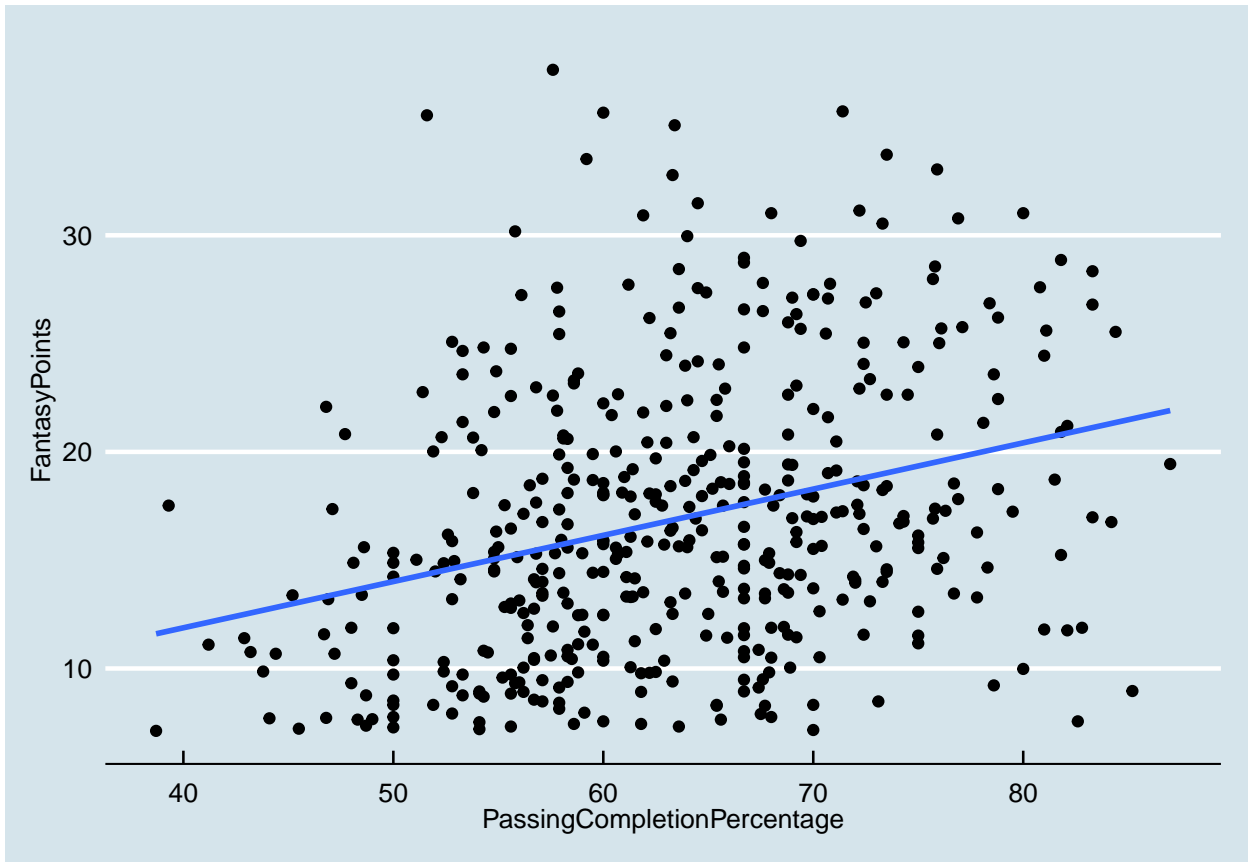
PassingCompletions + PassingAttempts + PassingCompletionPercentage + ...

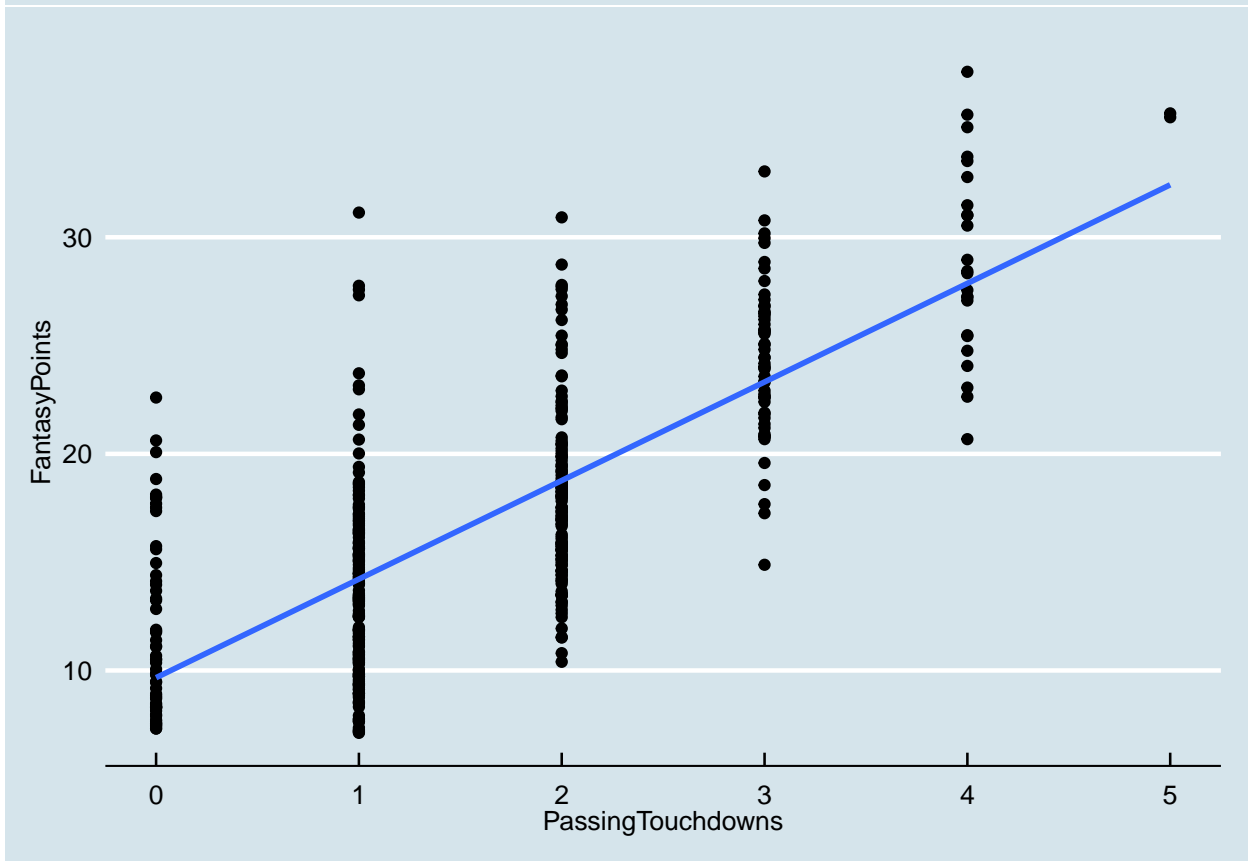
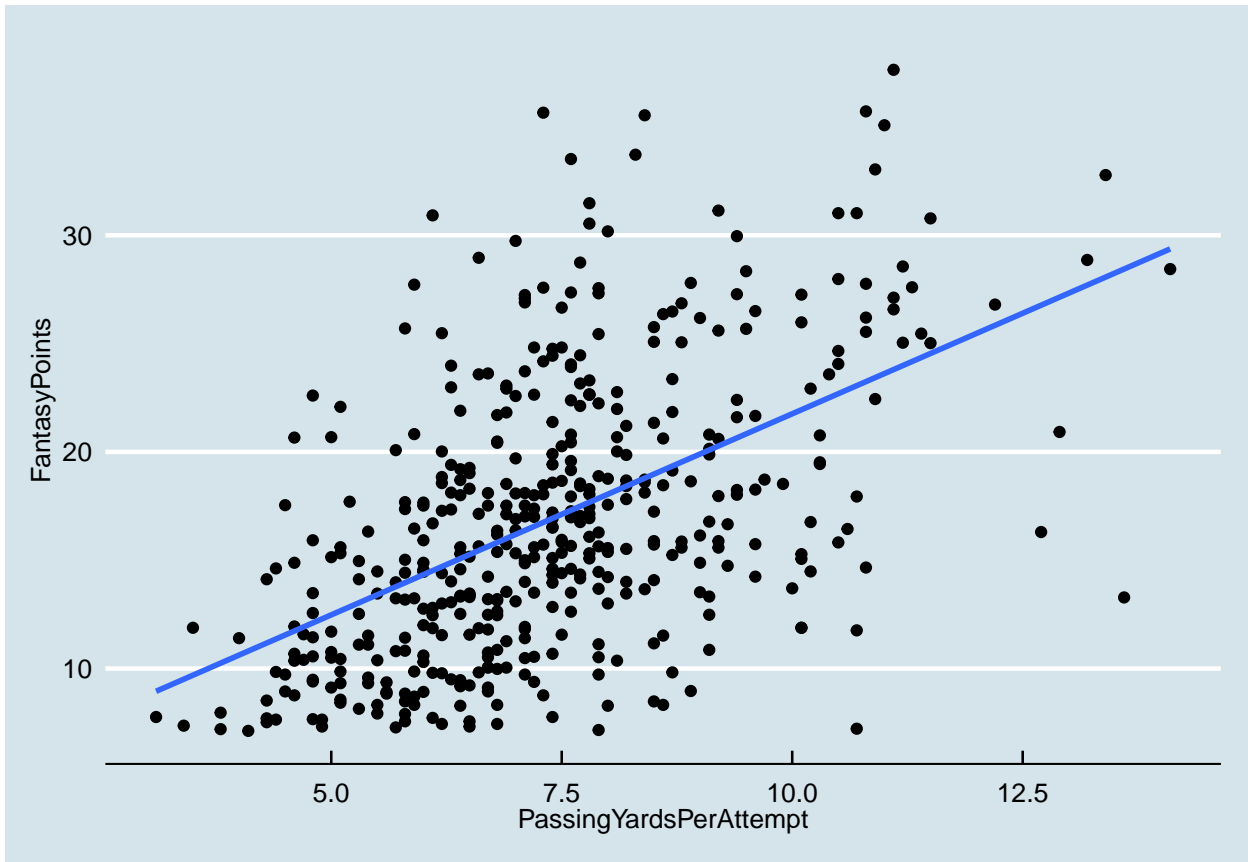
#### 1.6.4 Relationship between FantasyPoints and Individual predictors

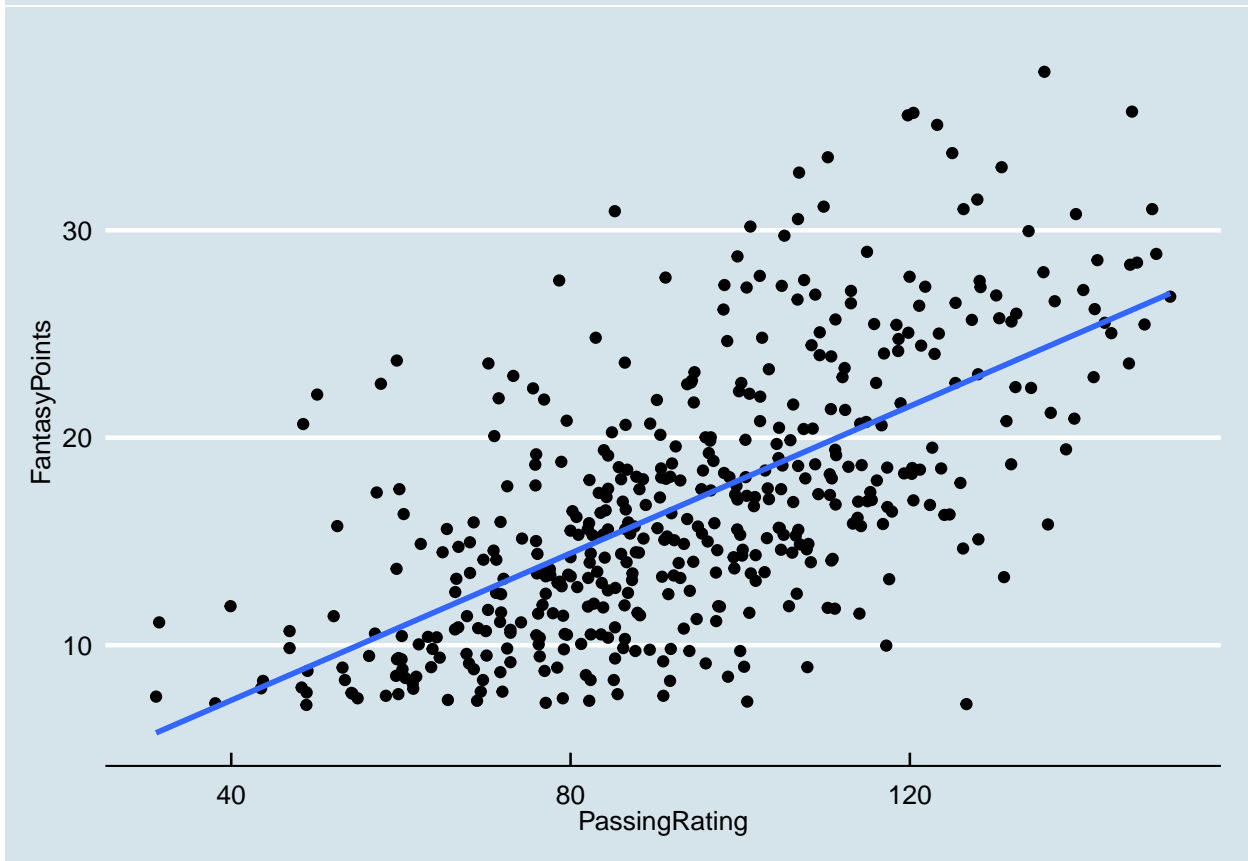
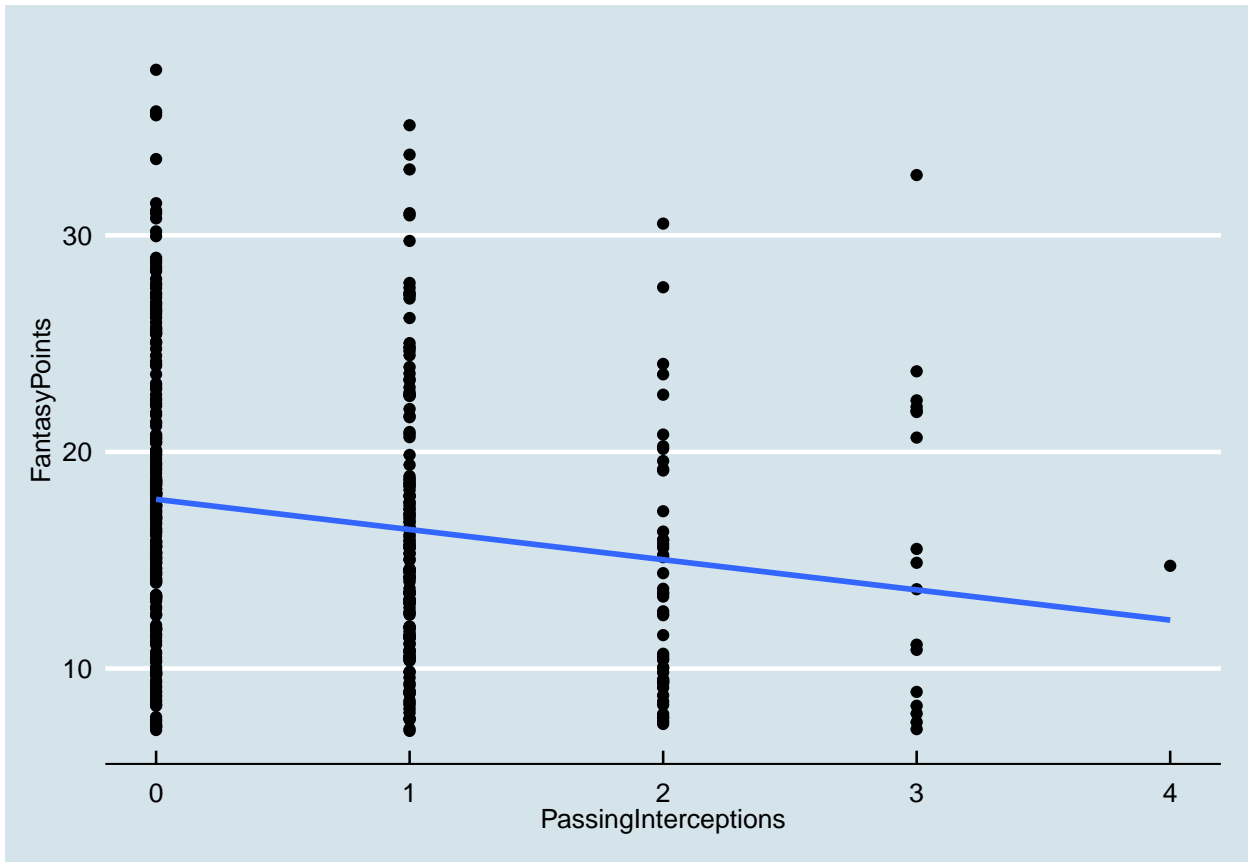
This makes sense - but we are actually trying to capture what the NEXT value for fantasy points is like. week since the fantasy score is a linear combination of the predictors for any given week. We need to sl

```
for (i in 7:19) {
  linear_plot <- QBCrossSectional %>%
    ggplot(aes_string(y="FantasyPoints",x=names(QBCrossSectional[i]))) +
    geom_point()+geom_smooth(method="lm",se=F)+
    theme(axis.text.x = element_text(angle=65, vjust=0.6))+
    theme_economist()
  print(linear_plot)
}
```

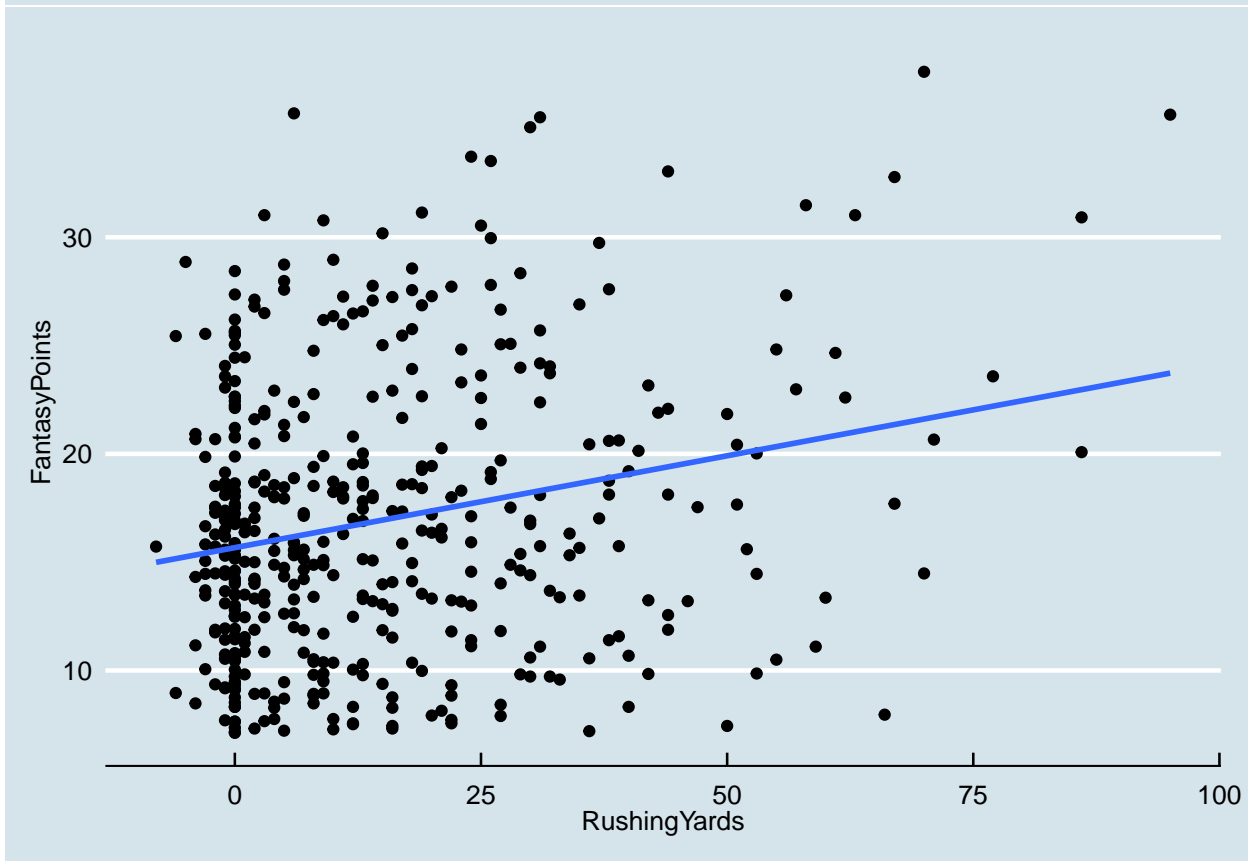
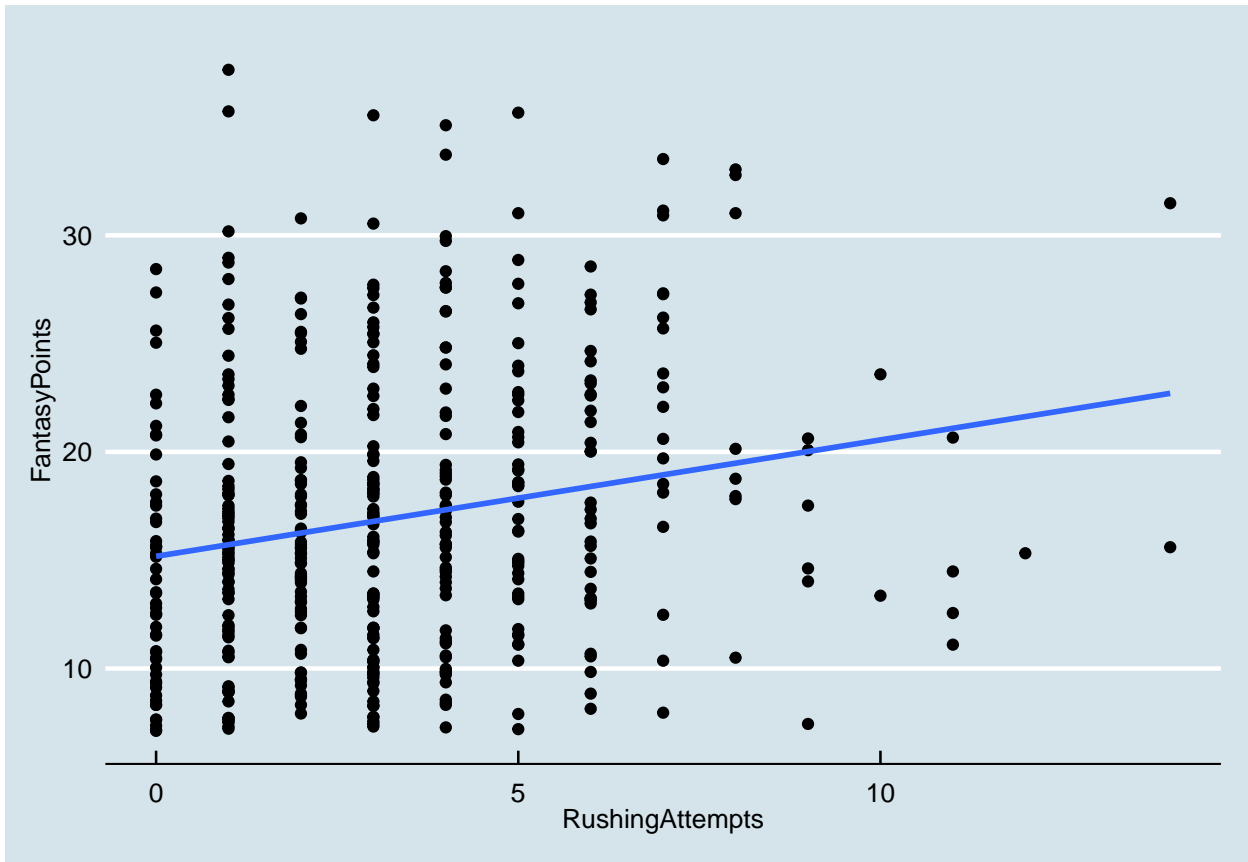


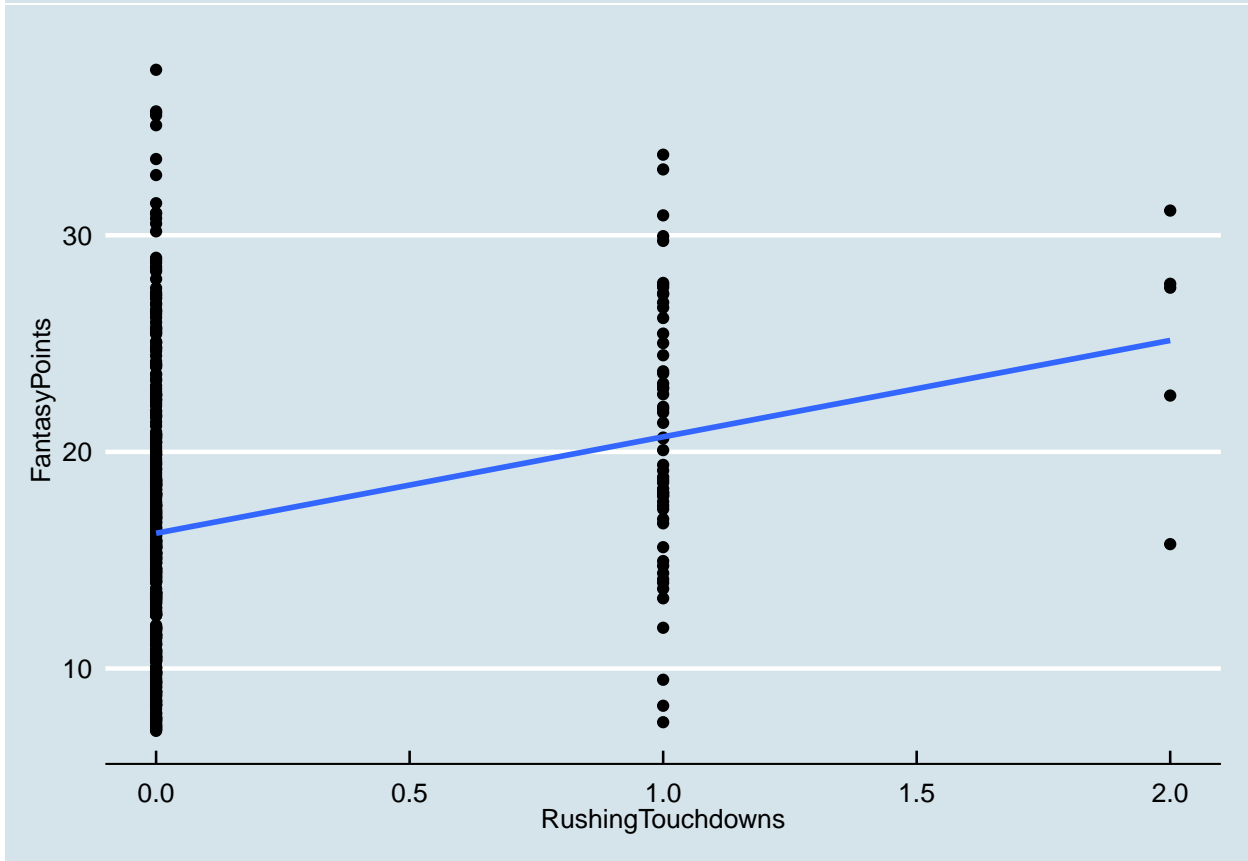
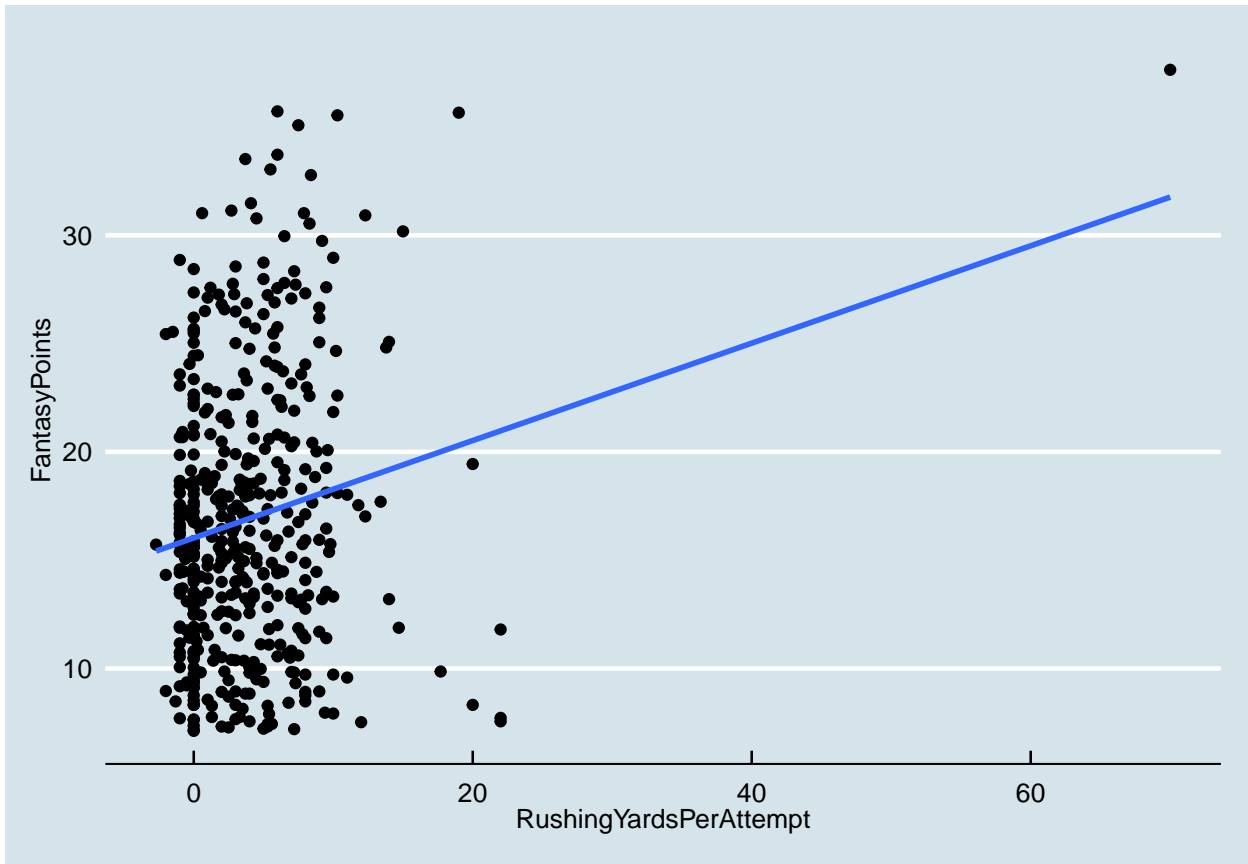


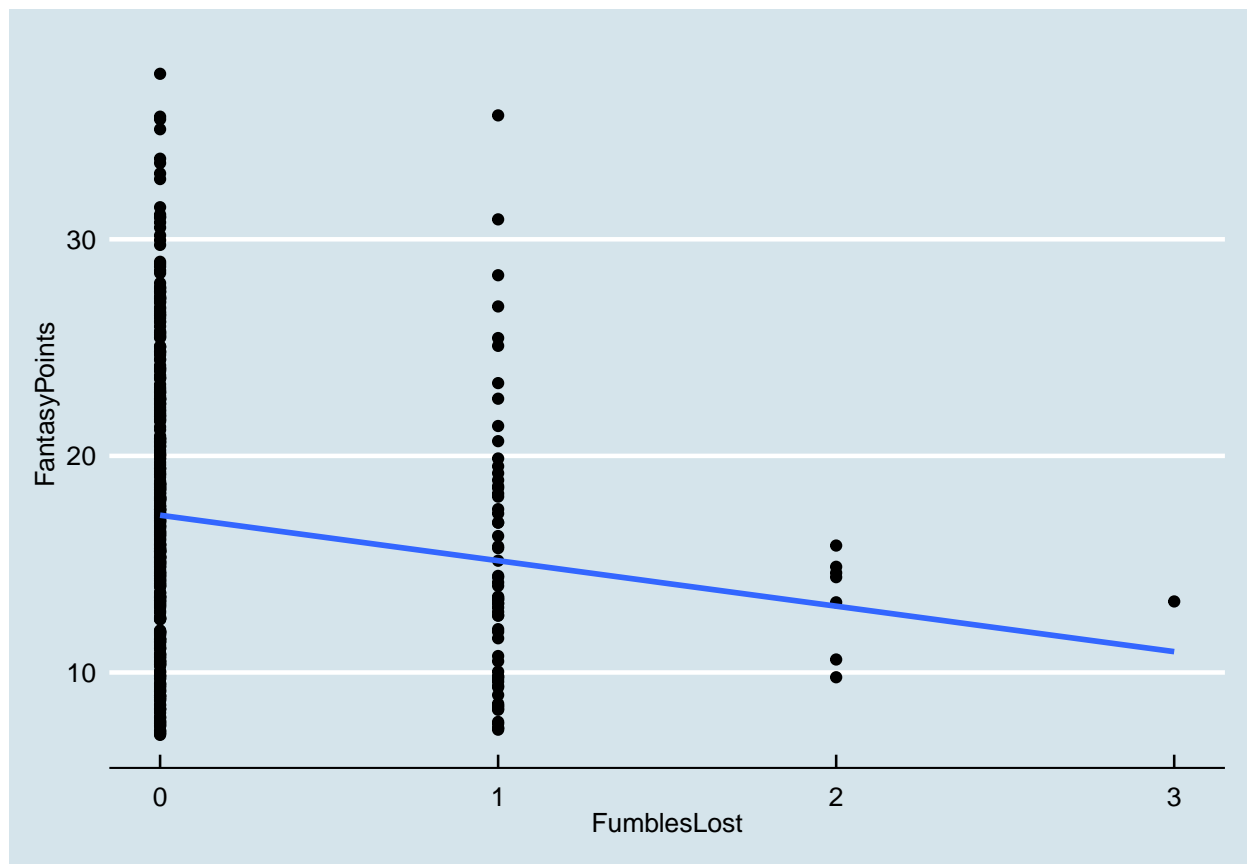












Drop rushing yards per attempt

## 1.7 Defensive stats

### 1.7.1 Player Defensive Stats

```
defensive_positions = getFootballData("https://fantasydata.com/FantasyStatsNFL/FantasyStats_Read?sort=F")
defensive_positions$StatSummary = c(NULL)
```

### 1.7.2 Team Defensive Stats

```
team_defense = getFootballData("https://fantasydata.com/FantasyStatsNFL/FantasyStats_Read?sort=FantasyP")
team_defense$StatSummary = c(NULL)
```

## Defensive Players and team defense by week

```
defensive_players_by_week = sqldf("SELECT
    Week,
    FantasyPosition,
    Count(*)
FROM defensive_positions
GROUP BY Week, FantasyPosition")

team_defense_by_week = sqldf("SELECT
```

```

Week,
FantasyPosition,
Count(*)
FROM team_defense
GROUP BY Week, FantasyPosition")

```

*# this looks good some teams are on bye in certain weeks*

Do some averages for Defense before stitching on to QB data

```

defensive_columns = c('Team', 'Week', 'TacklesForLoss', 'Sacks', 'QuarterbackHits', 'Interceptions', 'FantasyPoints')

team_defense = team_defense %>% select(defensive_columns) %>% rename('DefensiveFantasyPoints'='FantasyPoints')
mutate(WeeklyRank = dense_rank(DefensiveFantasyPoints))
# mutate(PlayerName = paste(FirstName, " ", LastName))
attach(team_defense)

```

## The following objects are masked from QBCrossSectional (pos = 3):

##

## Team, Week

## The following objects are masked from QBCrossSectional (pos = 4):

##

## Team, Week

## The following objects are masked from QBCrossSectional (pos = 5):

##

## Team, Week

## The following objects are masked from QBCrossSectional (pos = 7):

##

## Team, Week

```
team_defense$Week = as.factor(team_defense$Week)
```

```
sqldf("SELECT Week, Team, WeeklyRank FROM team_defense WHERE Week IN(1, 2) ORDER BY Team, Week")
```

```

##      Week Team WeeklyRank
## 1      1  ARI           8
## 2      2  ARI          12
## 3      1  ATL           6
## 4      2  ATL          14
## 5      1  BAL          14
## 6      2  BAL          15
## 7      1  BUF           9
## 8      2  BUF          12
## 9      1  CAR          11
## 10     2  CAR          12
## 11     1  CHI           3
## 12     2  CHI           6
## 13     1  CIN           5
## 14     2  CIN           9
## 15     1  CLE           4
## 16     2  CLE           8
## 17     1  DAL          10

```

## 18	2	DAL	4
## 19	1	DEN	4
## 20	2	DEN	14
## 21	1	DET	12
## 22	2	DET	15
## 23	1	GB	9
## 24	2	GB	4
## 25	1	HOU	1
## 26	2	HOU	11
## 27	1	IND	3
## 28	2	IND	9
## 29	1	JAX	15
## 30	2	JAX	3
## 31	1	KC	4
## 32	2	KC	13
## 33	1	LAC	8
## 34	2	LAC	5
## 35	1	LAR	15
## 36	2	LAR	4
## 37	2	MIA	4
## 38	1	MIN	3
## 39	2	MIN	4
## 40	1	NE	2
## 41	2	NE	4
## 42	1	NO	1
## 43	2	NO	2
## 44	1	NYG	3
## 45	2	NYG	7
## 46	1	NYJ	5
## 47	2	NYJ	1
## 48	1	OAK	3
## 49	2	OAK	11
## 50	1	PHI	13
## 51	2	PHI	6
## 52	1	PIT	12
## 53	2	PIT	10
## 54	1	SEA	7
## 55	2	SEA	10
## 56	1	SF	5
## 57	2	SF	9
## 58	2	TB	16
## 59	1	TEN	3
## 60	2	TEN	11
## 61	1	WAS	10
## 62	2	WAS	9

### Add defensive matchups

```
QBCrossSectionalDefensiveOverlay = QBCrossSectional %>% left_join(team_defense, by = c('Week'='Week', 'U
```

### 1.7.3 Add some lag data for QB

CumulativeVariables (these should definitely be combined into a weekly ranking)

```
#Should we just train on second half of 2017?
QBCrossSectionalDefensiveOverlayCumulativePassYards = QBCrossSectionalDefensiveOverlay %>% group_by(Play
  , CumulativeAveragePassingTouchdowns=cummean(PassingTouchdowns)
  , CumulativeAverageCompletions = cummean(PassingCompletions) # not sure that completions matter
  , CumulativeMaxPassingTouchdowns = cummax(PassingTouchdowns)
  , CumulativeMaxPassingYards = cummax(PassingYards)
  , CumulativeMaxPassingAttempts = cummax(PassingAttempts)
  , CumulativeMaxPassingRating = cummax(PassingRating)
  , CumulativeMaxCompletions = cummax(PassingCompletions)
  , CumulativeMaxPassYardsPerAttempt = cummax(PassingYardsPerAttempt)
  , CumulativeMinPassingTouchdowns = cummin(PassingTouchdowns)
  , CumulativeMinPassingYards = cummin(PassingYards) #Let's get mins to capture downside risk
  , CumulativeMinPassingAttempts = cummin(PassingAttempts)
  , CumulativeMinPassingRating = cummin(PassingRating)
  , CumulativeMinCompletions = cummin(PassingCompletions)
  , CumulativeMinPassYardsPerAttempt = cummin(PassingYardsPerAttempt)
  , LastWeekQuarterBackRating = lag(PassingRating)
  , LastWeekQuarterPassingYards = lag(PassingYards)
  , LastWeekQuarterPassingTouchdowns = lag(PassingTouchdowns)
  , NextWeekFantasyPoints = lead(FantasyPoints) #Target Variable
)

QBCrossSectionalDefensiveOverlayCumulativePassYards %>% filter(PlayerID == 6739) %>% write.csv('alex_sm
final_ds <- QBCrossSectionalDefensiveOverlayCumulativePassYards
attach(QBCrossSectionalDefensiveOverlayCumulativePassYards)

## The following objects are masked from team_defense:
##
##   AssistedTackles, DefensiveFantasyPoints, DefensiveTouchdowns,
##   FumblesForced, FumblesRecovered, Interceptions,
##   PassesDefended, PointsAllowedByDefenseSpecialTeams,
##   QuarterbackHits, Sacks, SackYards, Safeties, SoloTackles,
##   TacklesForLoss, Team, Week, WeeklyRank

## The following objects are masked from QBCrossSectional (pos = 4):
##
##   FantasyPoints, FumblesLost, GameDate, Opponent,
##   PassingAttempts, PassingCompletionPercentage,
##   PassingCompletions, PassingInterceptions, PassingRating,
##   PassingTouchdowns, PassingYards, PassingYardsPerAttempt,
##   PlayerID, Position, RushingAttempts, RushingTouchdowns,
##   RushingYards, RushingYardsPerAttempt, Team, TeamIsHome, Week

## The following objects are masked from QBCrossSectional (pos = 5):
##
##   FantasyPoints, FumblesLost, GameDate, Opponent,
##   PassingAttempts, PassingCompletionPercentage,
##   PassingCompletions, PassingInterceptions, PassingRating,
##   PassingTouchdowns, PassingYards, PassingYardsPerAttempt,
##   PlayerID, Position, RushingAttempts, RushingTouchdowns,
##   RushingYards, RushingYardsPerAttempt, Team, TeamIsHome, Week
```

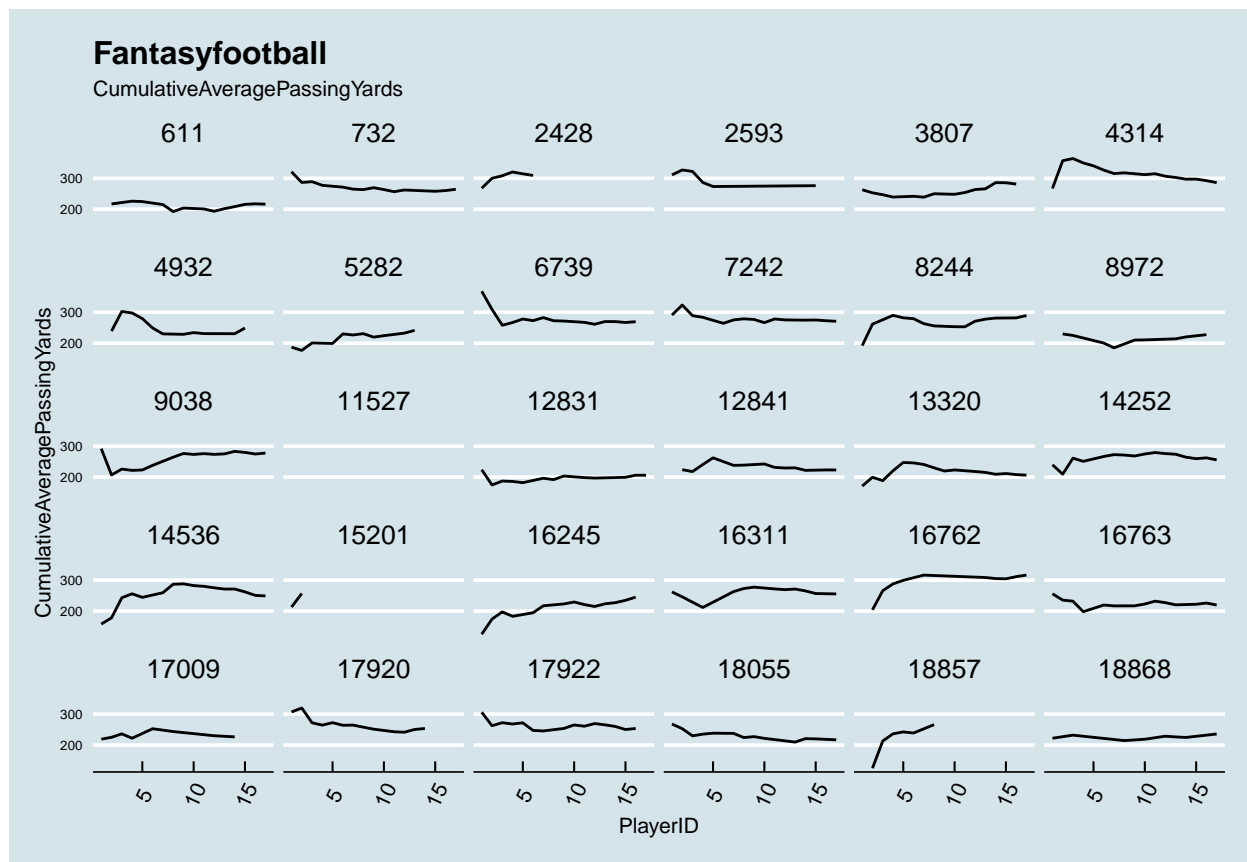
```
## The following objects are masked from QBCrossSectional (pos = 6):
##
##   FantasyPoints, FumblesLost, GameDate, Opponent,
##   PassingAttempts, PassingCompletionPercentage,
##   PassingCompletions, PassingInterceptions, PassingRating,
##   PassingTouchdowns, PassingYards, PassingYardsPerAttempt,
##   PlayerID, Position, RushingAttempts, RushingTouchdowns,
##   RushingYards, RushingYardsPerAttempt, Team, TeamIsHome, Week
## The following objects are masked from QBCrossSectional (pos = 8):
##
##   FantasyPoints, FumblesLost, GameDate, Opponent,
##   PassingAttempts, PassingCompletionPercentage,
##   PassingCompletions, PassingInterceptions, PassingRating,
##   PassingTouchdowns, PassingYards, PassingYardsPerAttempt,
##   PlayerID, Position, RushingAttempts, RushingTouchdowns,
##   RushingYards, RushingYardsPerAttempt, Team, TeamIsHome, Week
## The following object is masked from package:ggplot2:
##
##   Position
```

#### 1.7.4 Individuals Line plots for cumulative averages by week

```
for(p in 37:51){
  #print(paste("violin plots for ",names(players_ds[p])))
  for (player in seq(1,length(unique(final_ds$PlayerID)),by=30)){
    a_size <- player + 29
    players_ds <- final_ds %>% filter(PlayerID %in% unique(final_ds$PlayerID)[player:a_size])

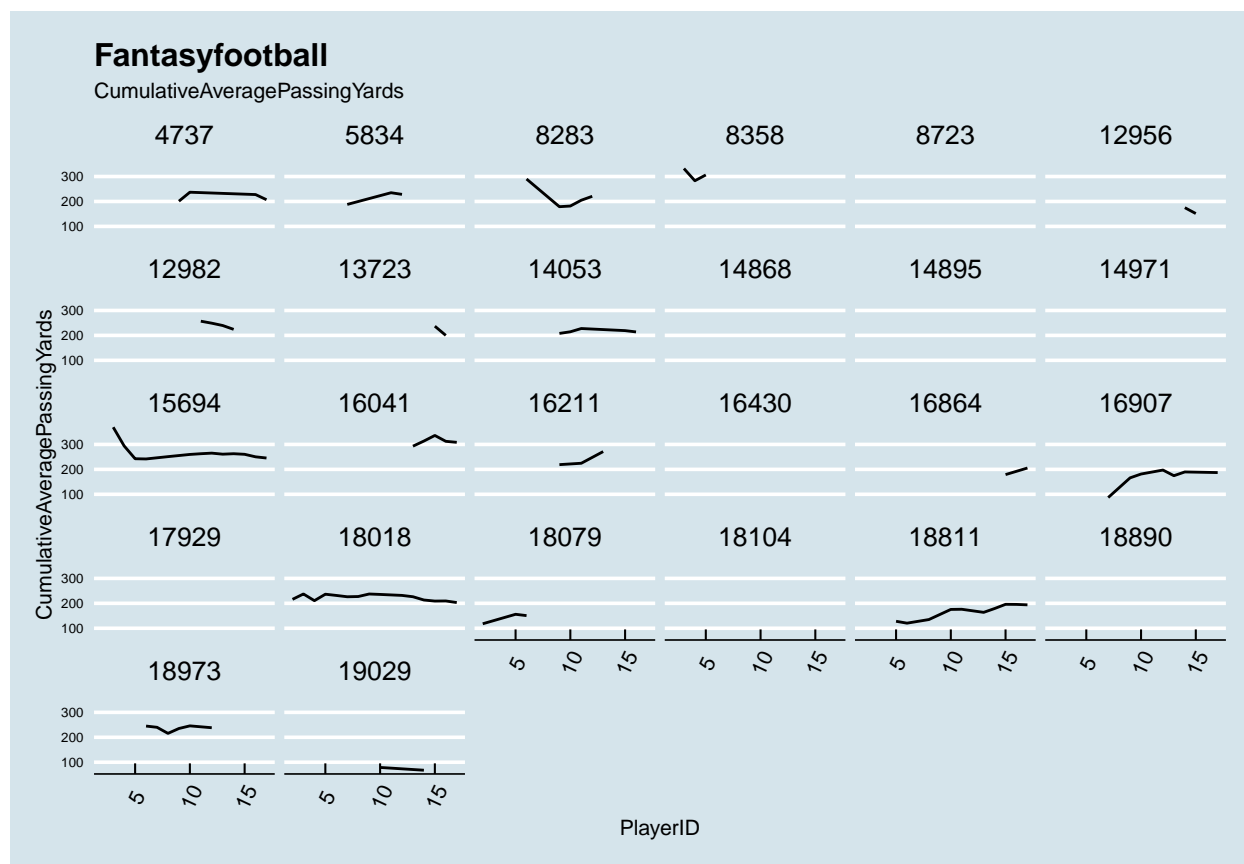
    line_plot <- players_ds %>%
      ggplot(aes_string(x="as.numeric(Week)",y=names(players_ds[p])))+
      ggtitle(names(players_ds[p]))+
      geom_line(show.legend = FALSE)+
      xlab("PlayerID")+
      ylab(names(players_ds[p]))+
      labs(title="Fantasyfootball",
           subtitle=names(players_ds[p]),
           caption="Source: Fantasyfootball")+
      theme_economist(base_size=8)+theme(axis.text.y = element_text(size=5))+
      theme(axis.text.x = element_text(angle=65, vjust=0.6))+facet_wrap(~PlayerID)
    suppressWarnings(print(line_plot))
  }
}
```

```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```

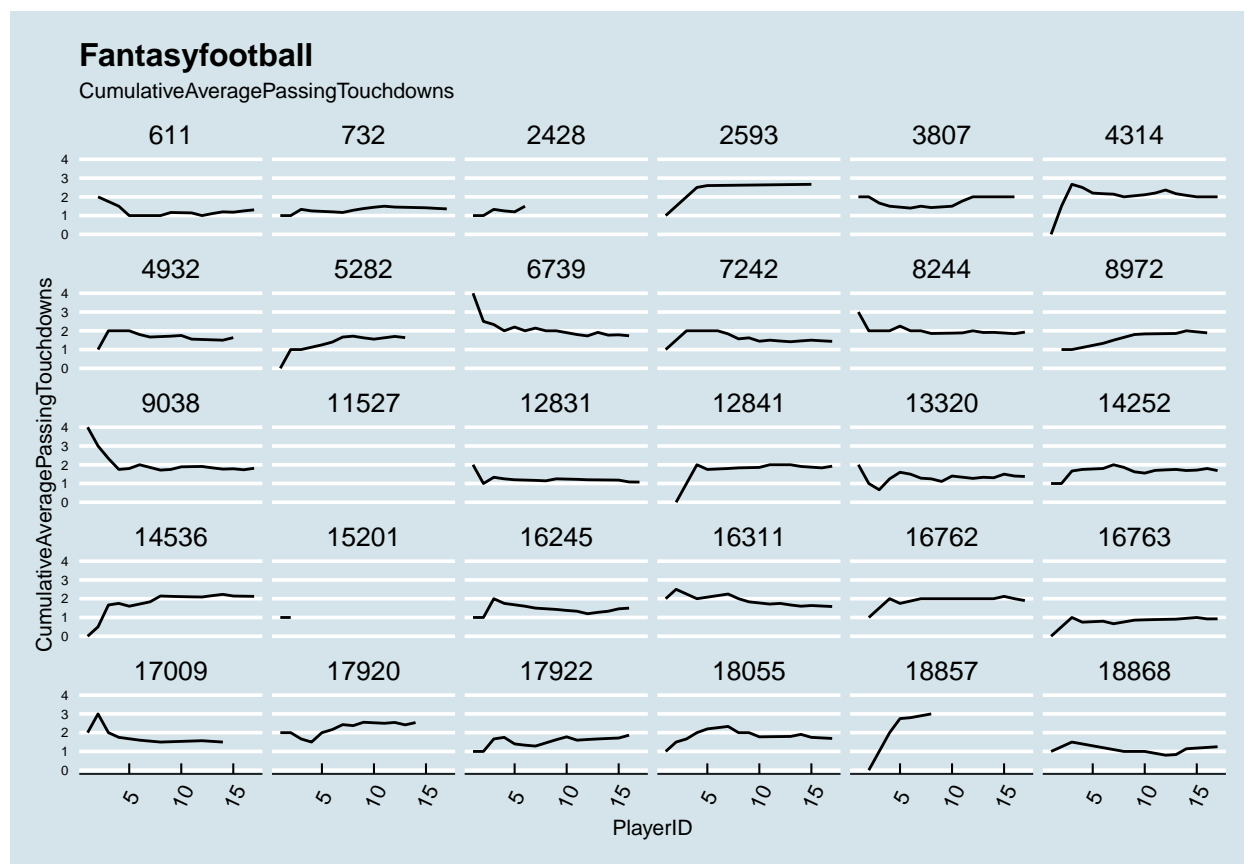


```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
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## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```

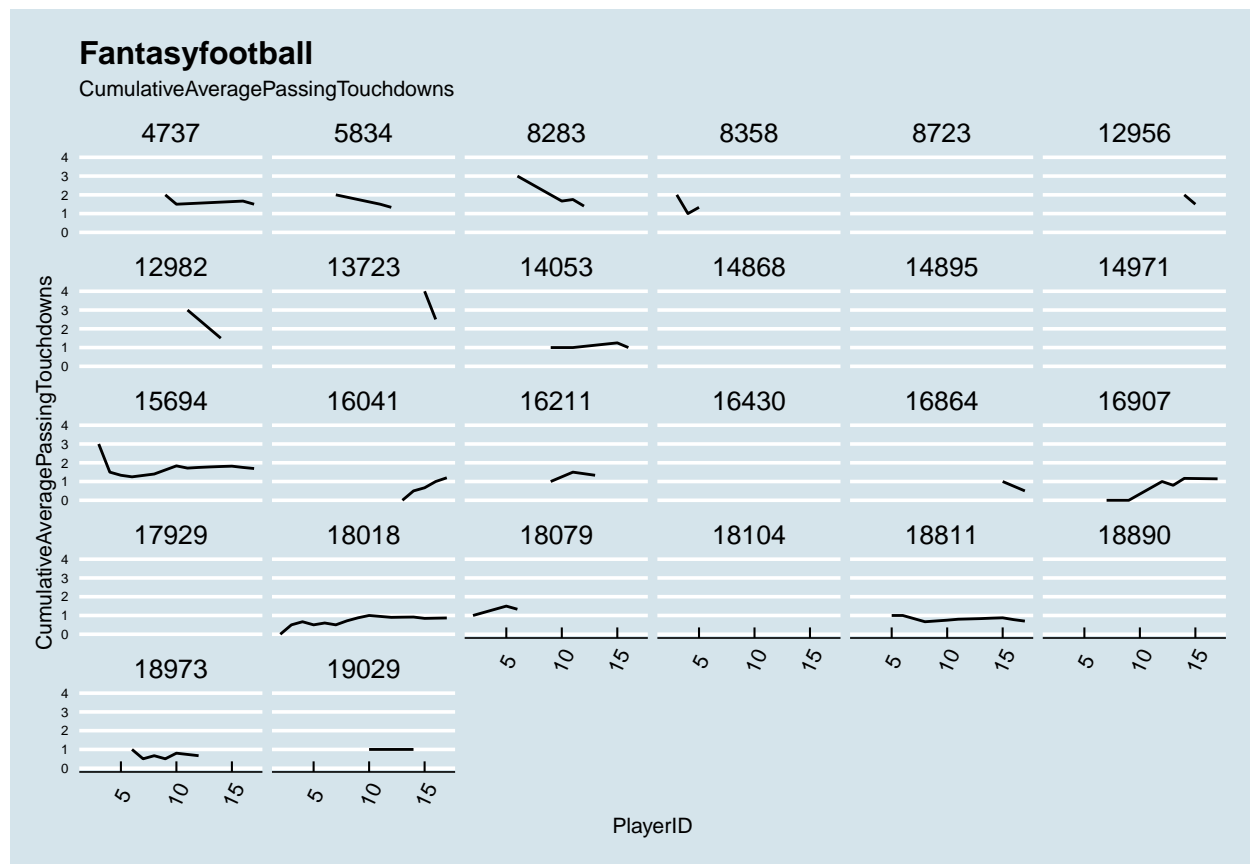




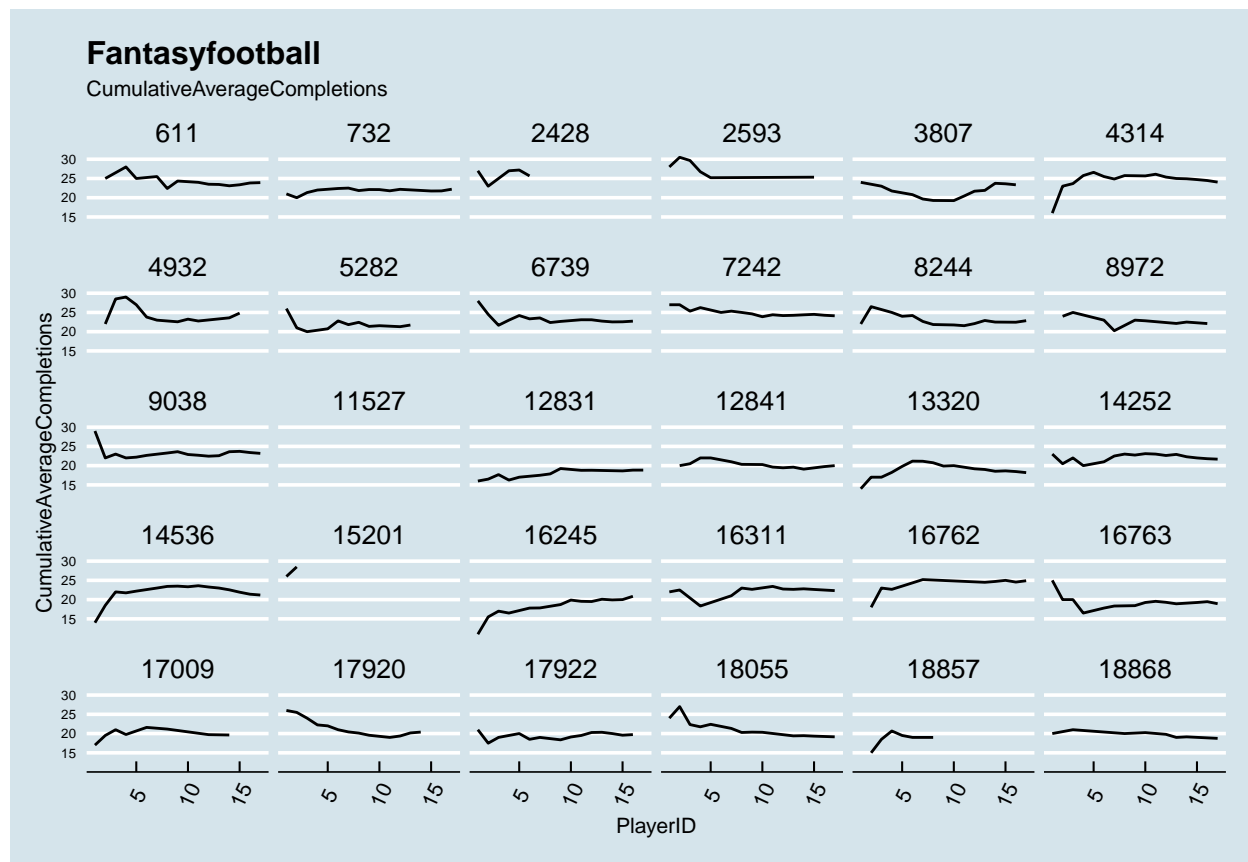
```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```



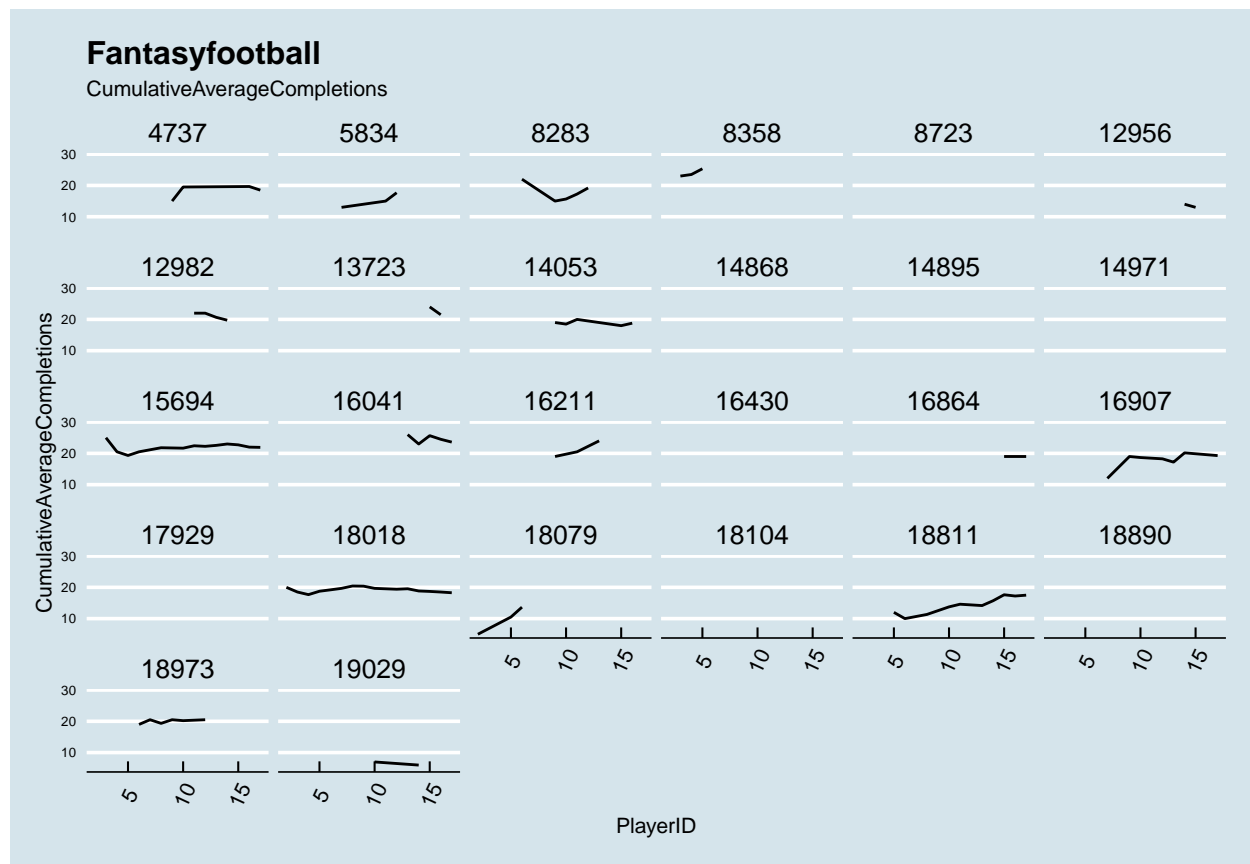
```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
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## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```



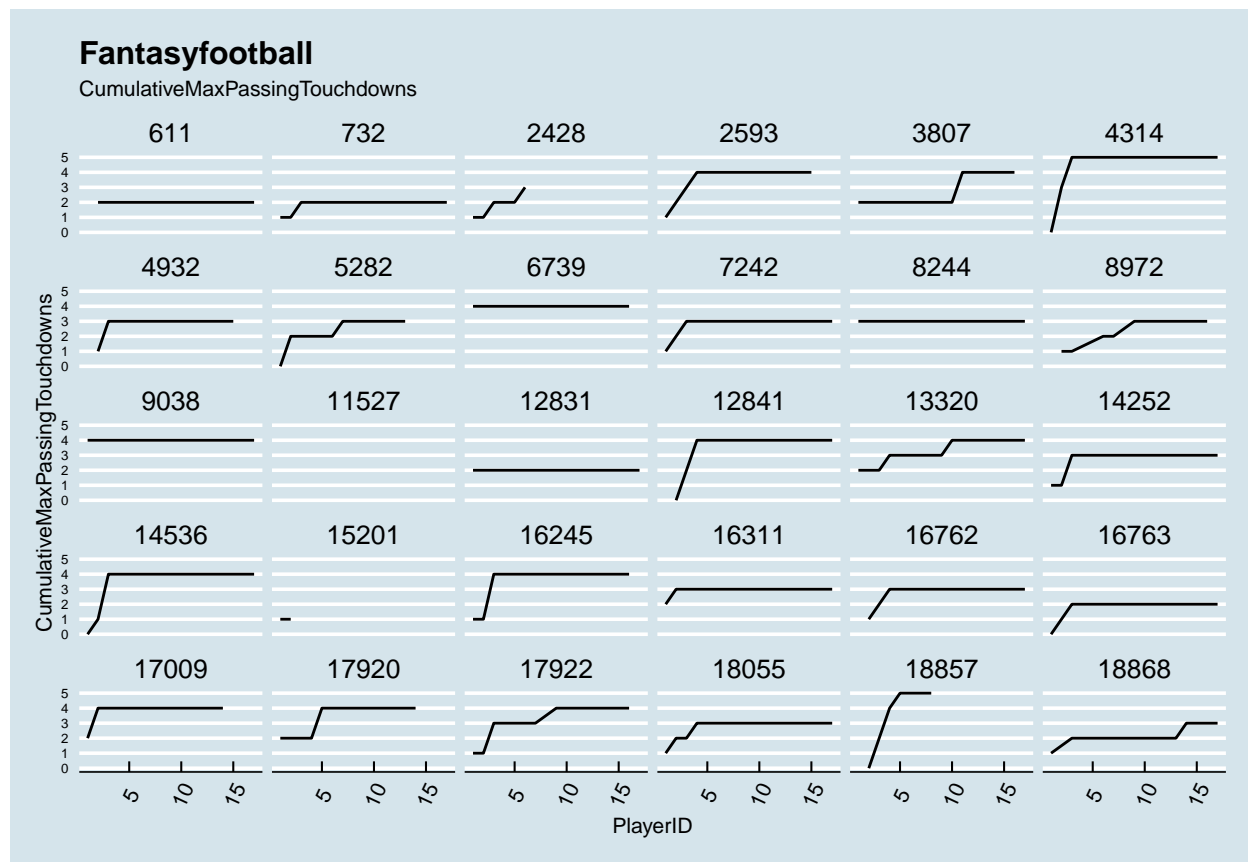
```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```



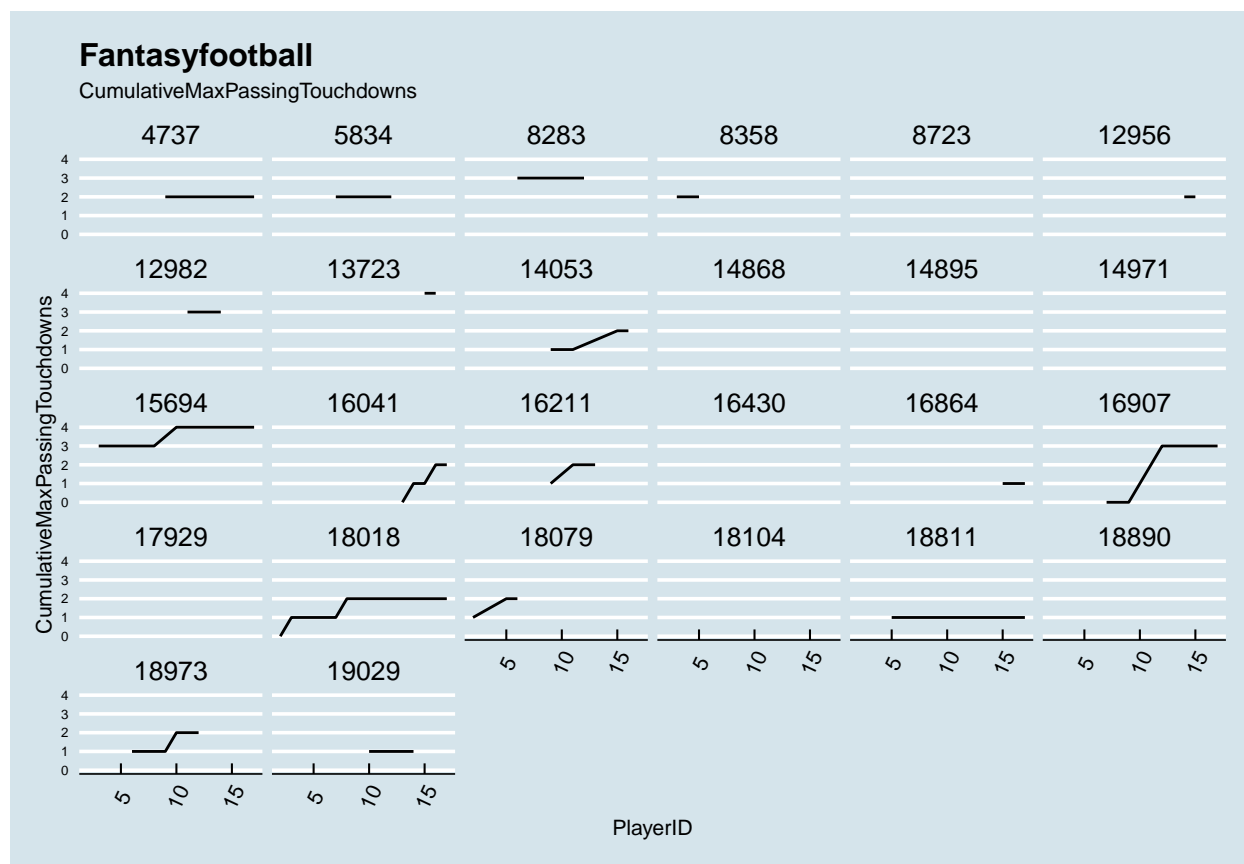
```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
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## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```



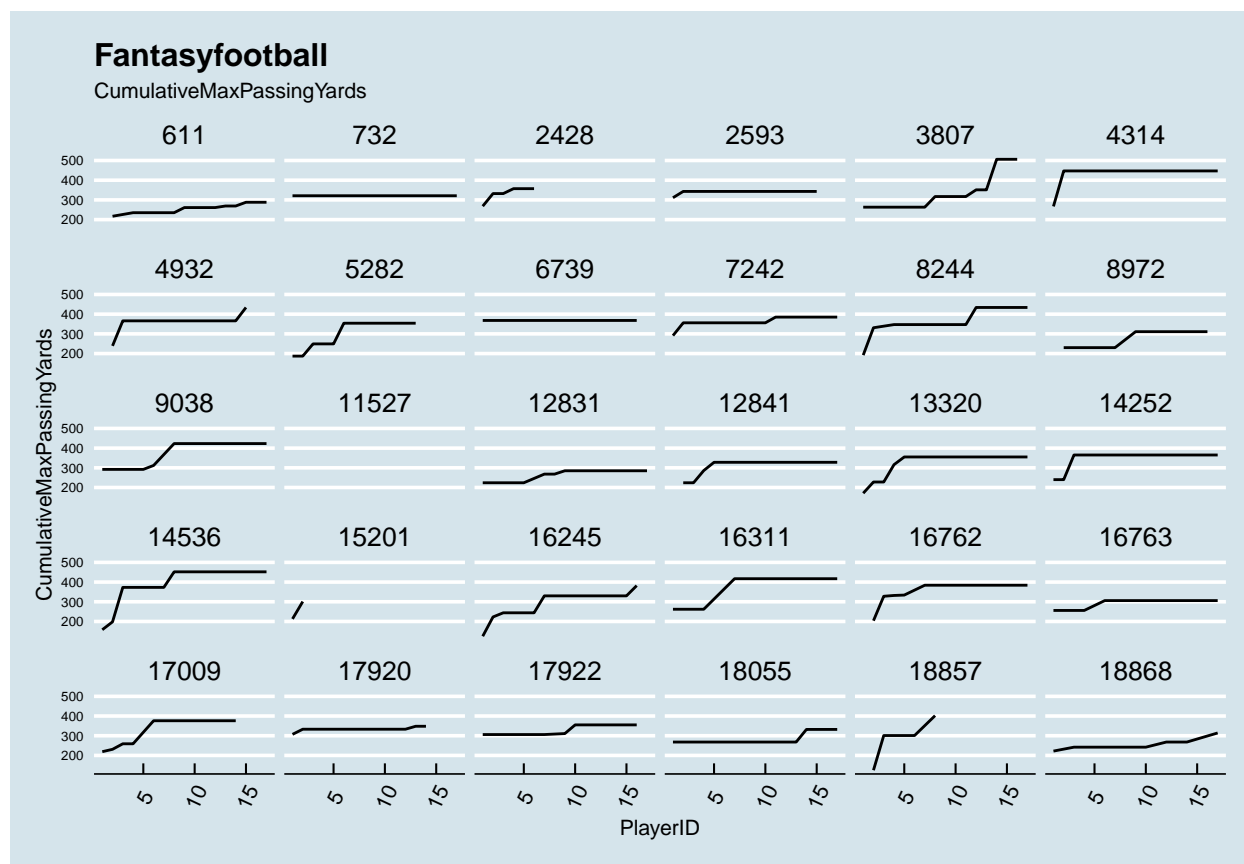
```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```



```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
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## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```

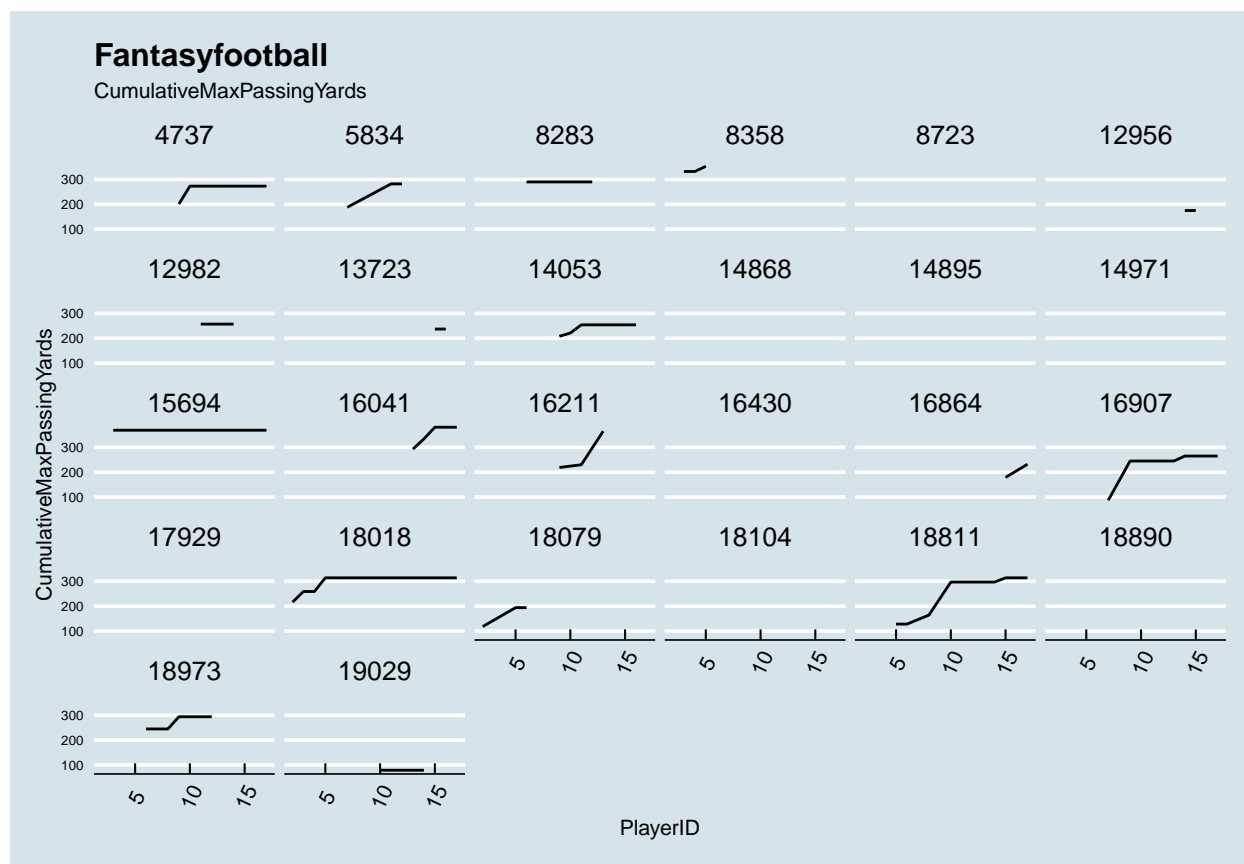


```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```

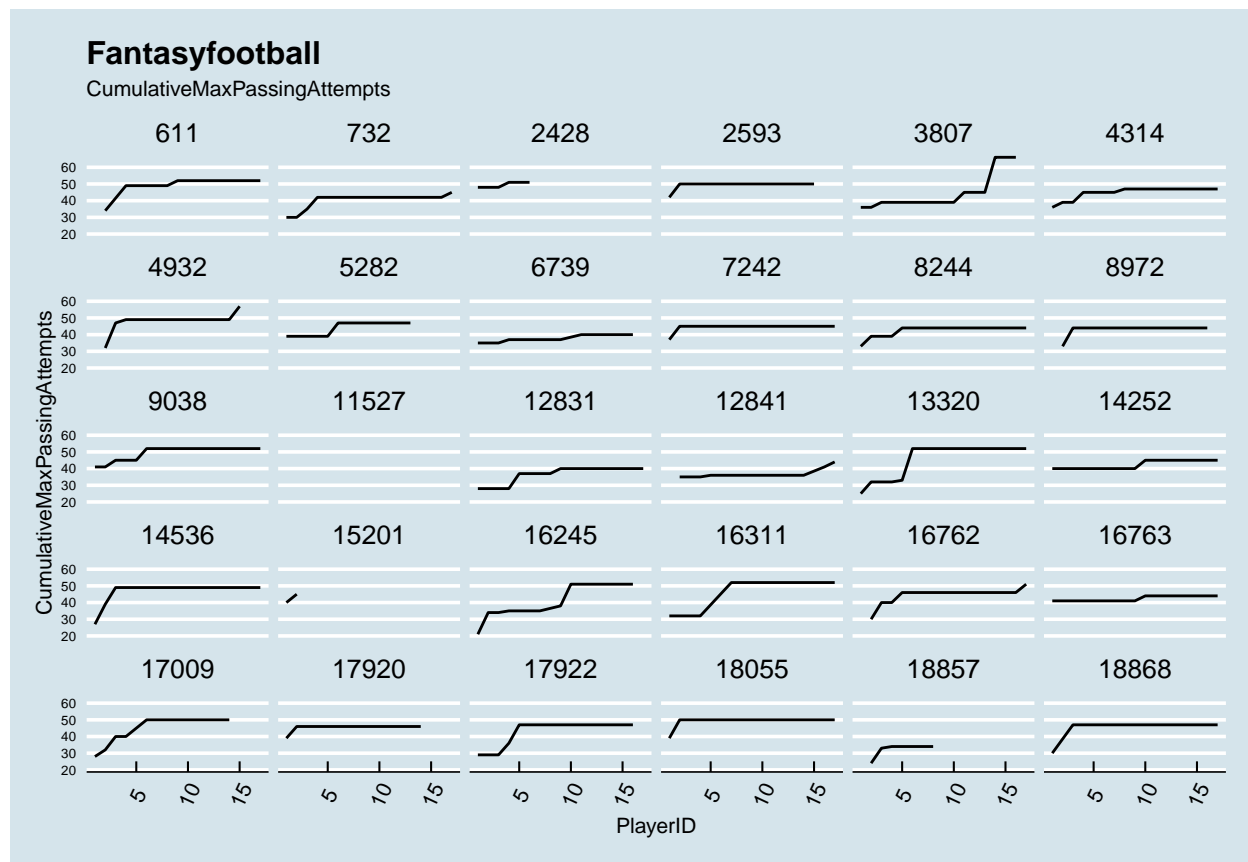


```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```

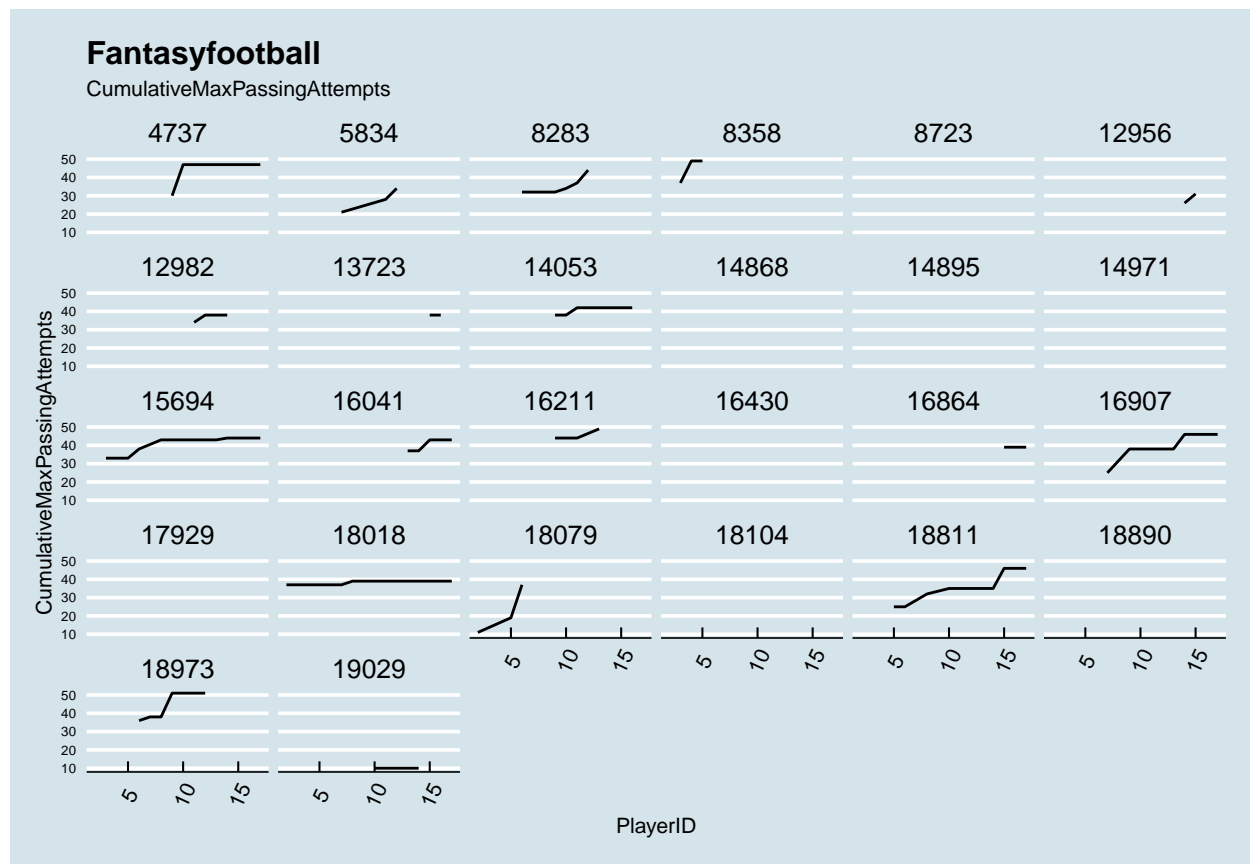




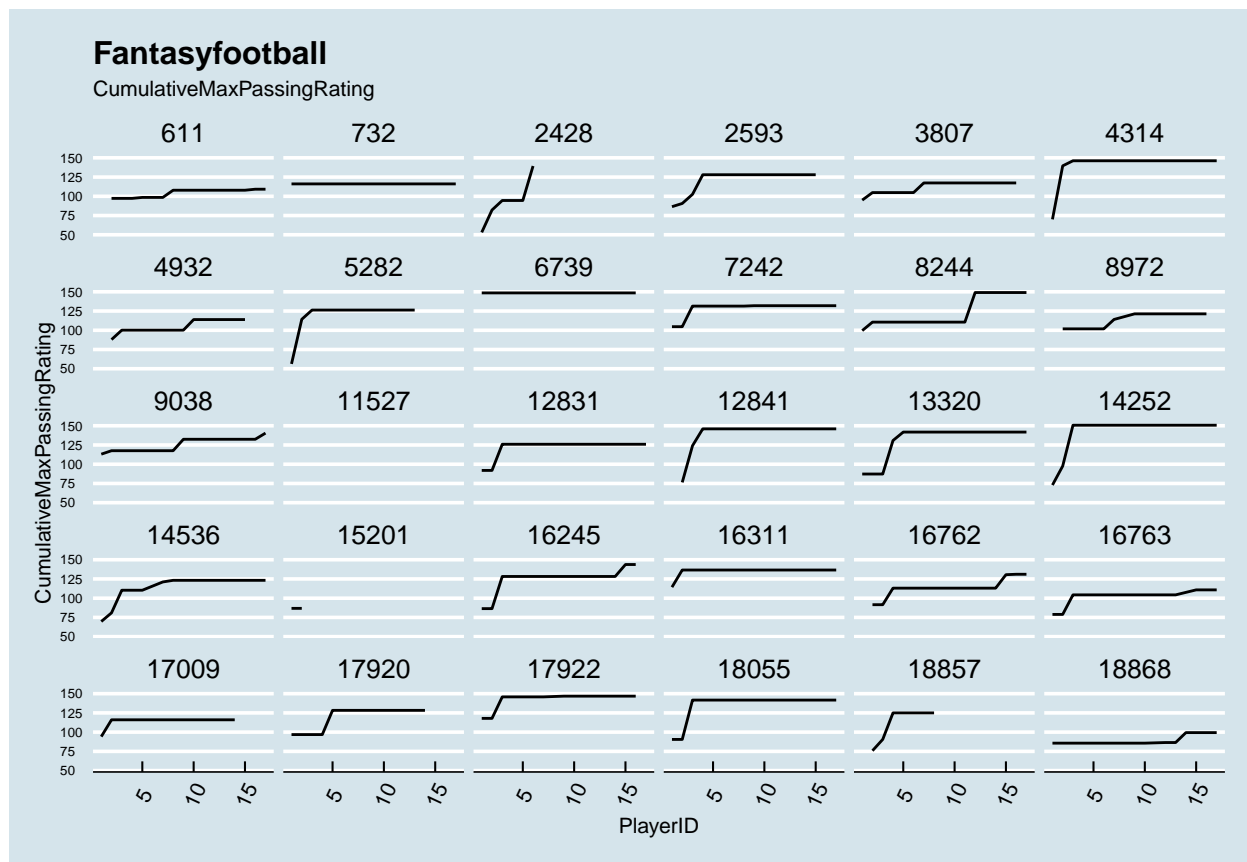
```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```



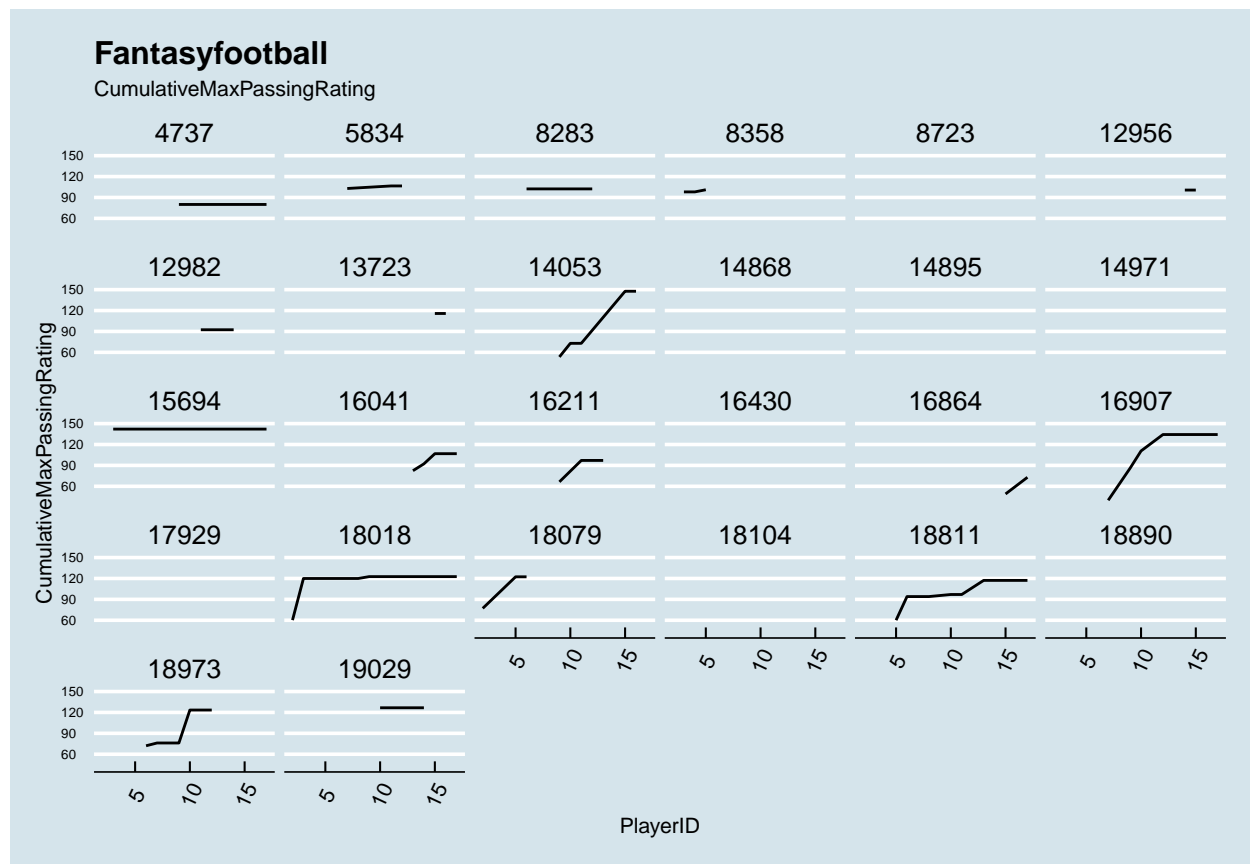
```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```



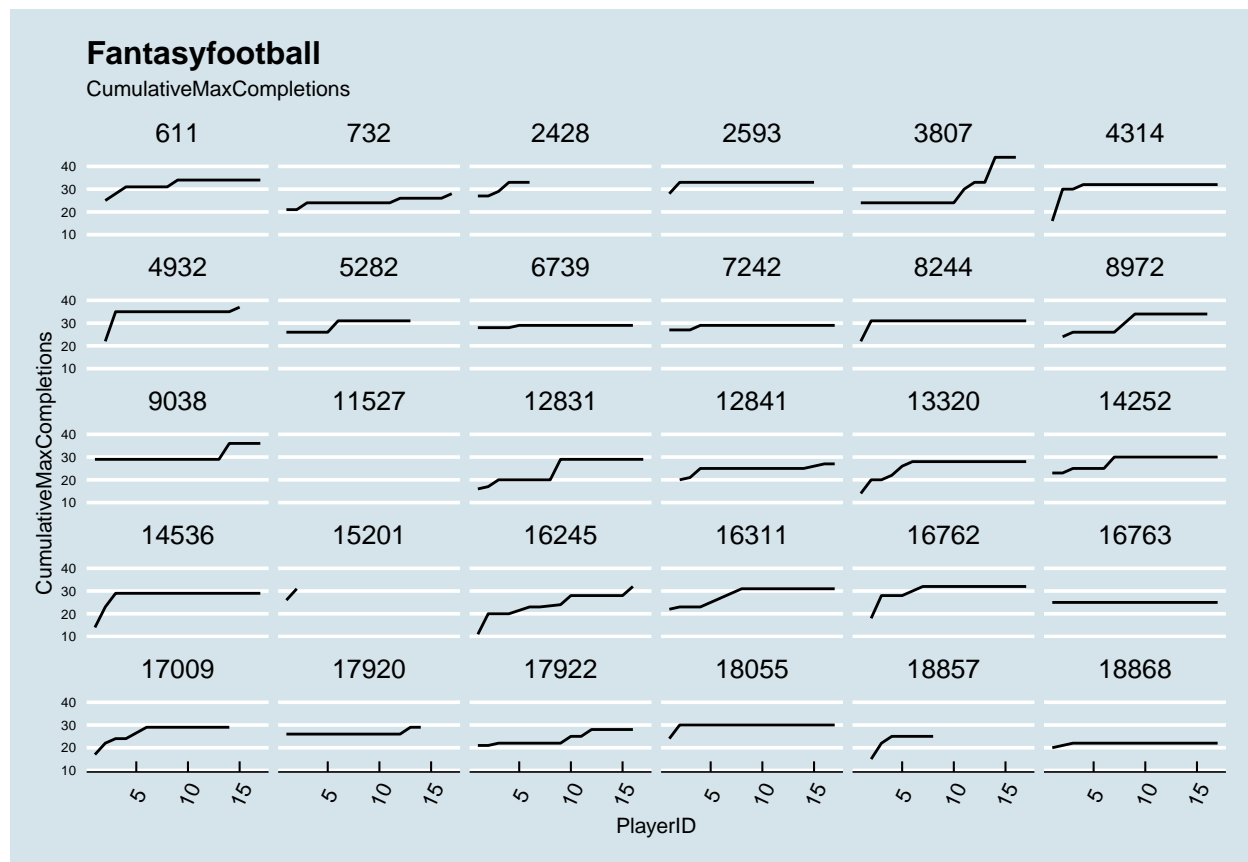
```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```



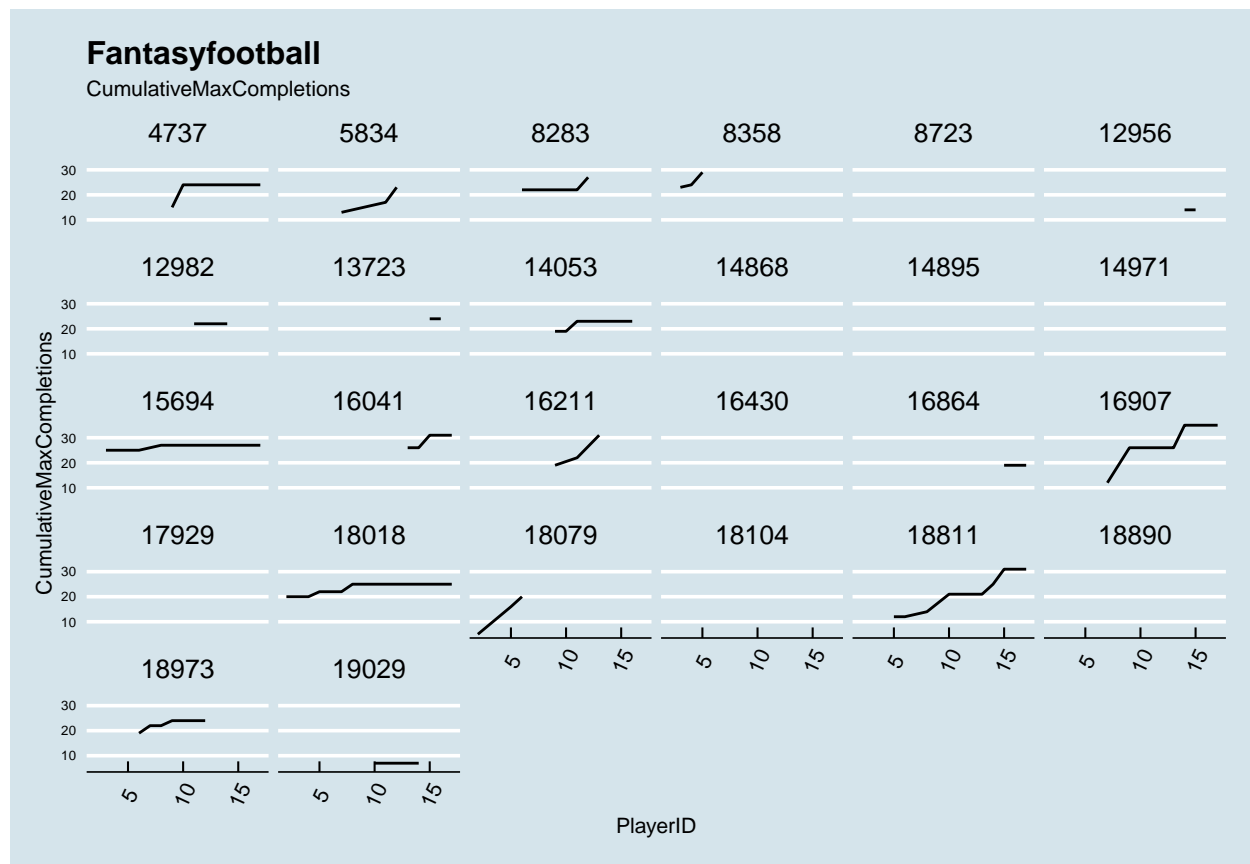
```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
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## adjust the group aesthetic?
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## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```



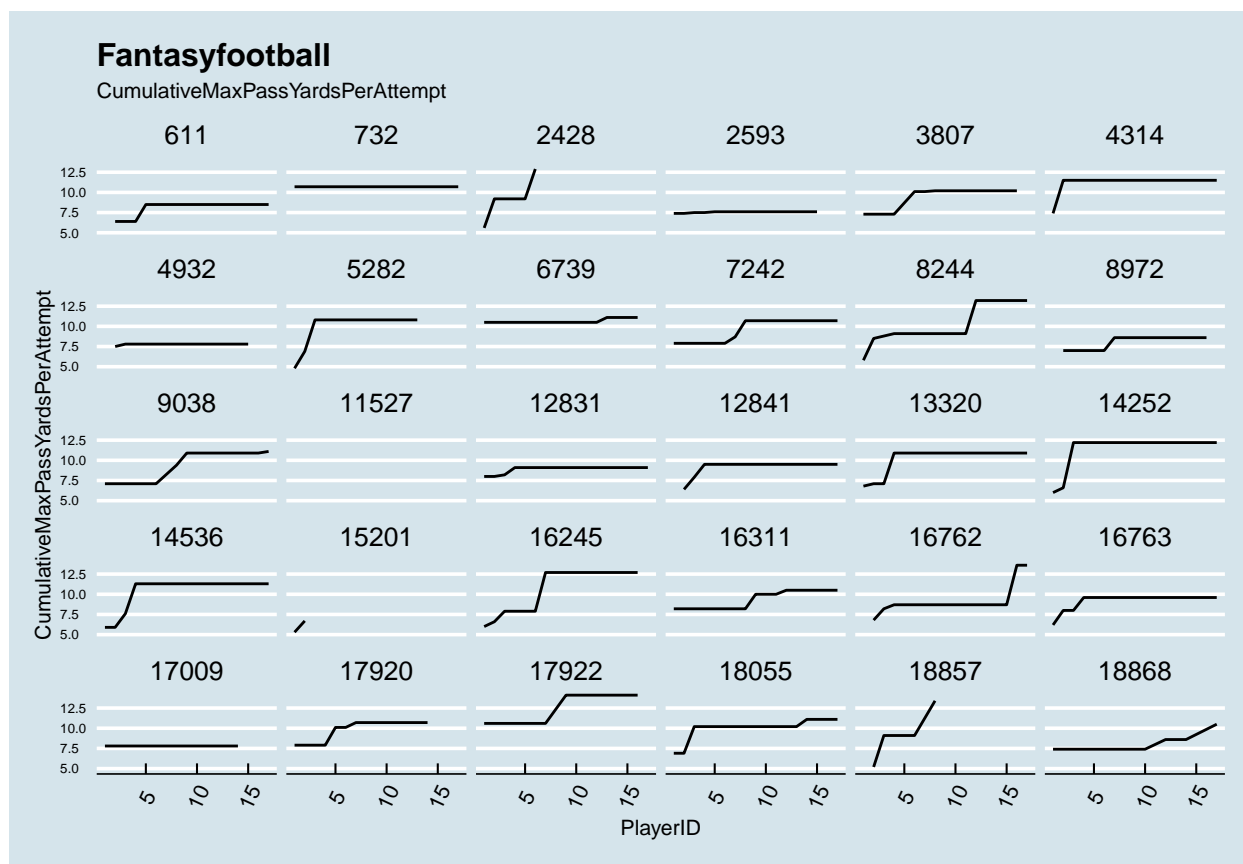
```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```



```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
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## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```

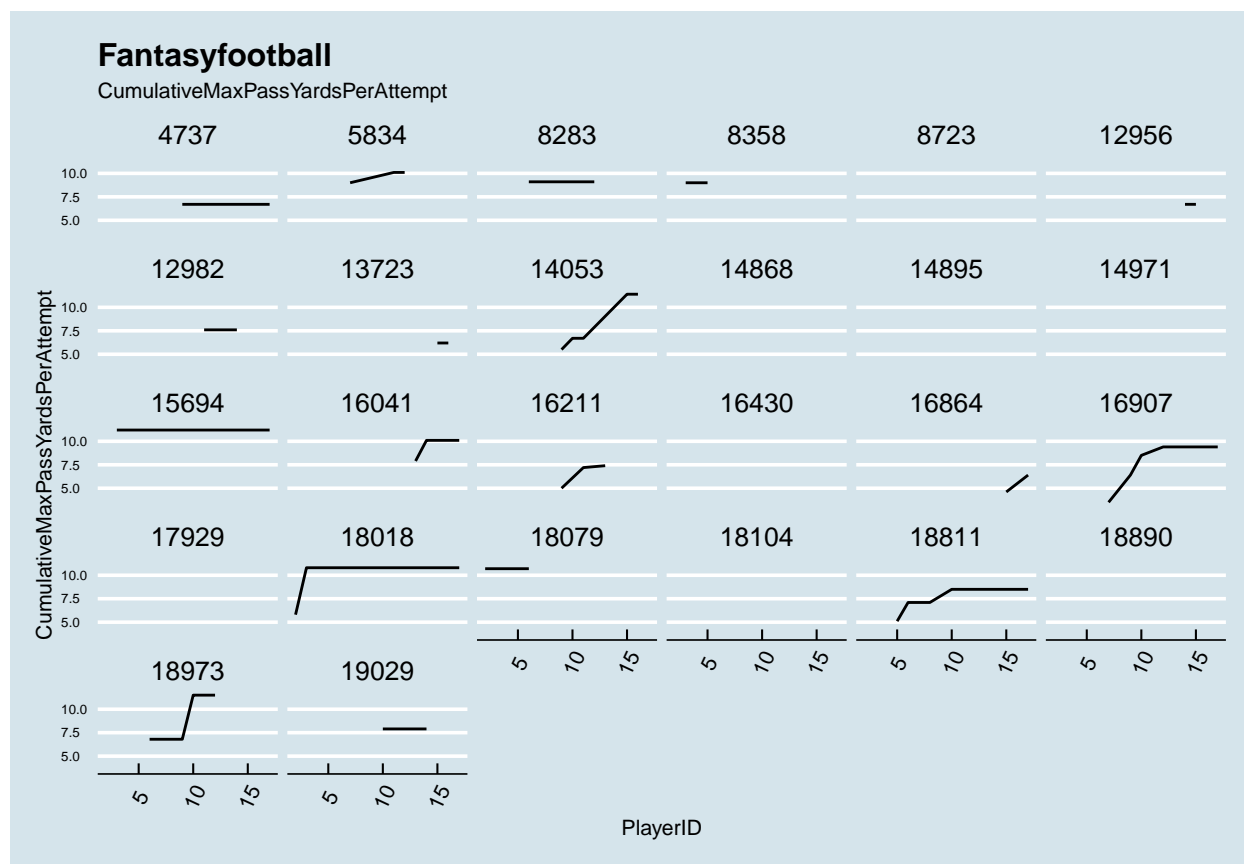


```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```

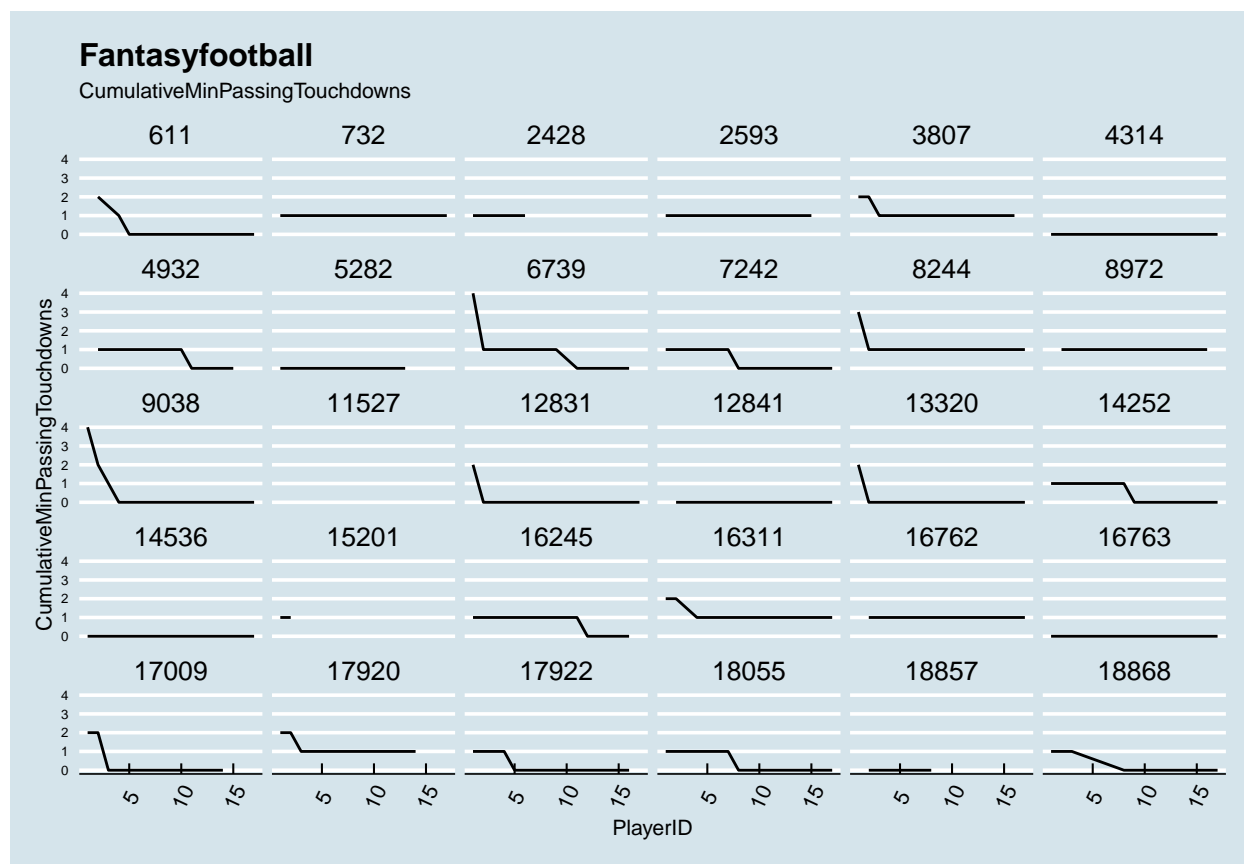


```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
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## geom_path: Each group consists of only one observation. Do you need to
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## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```

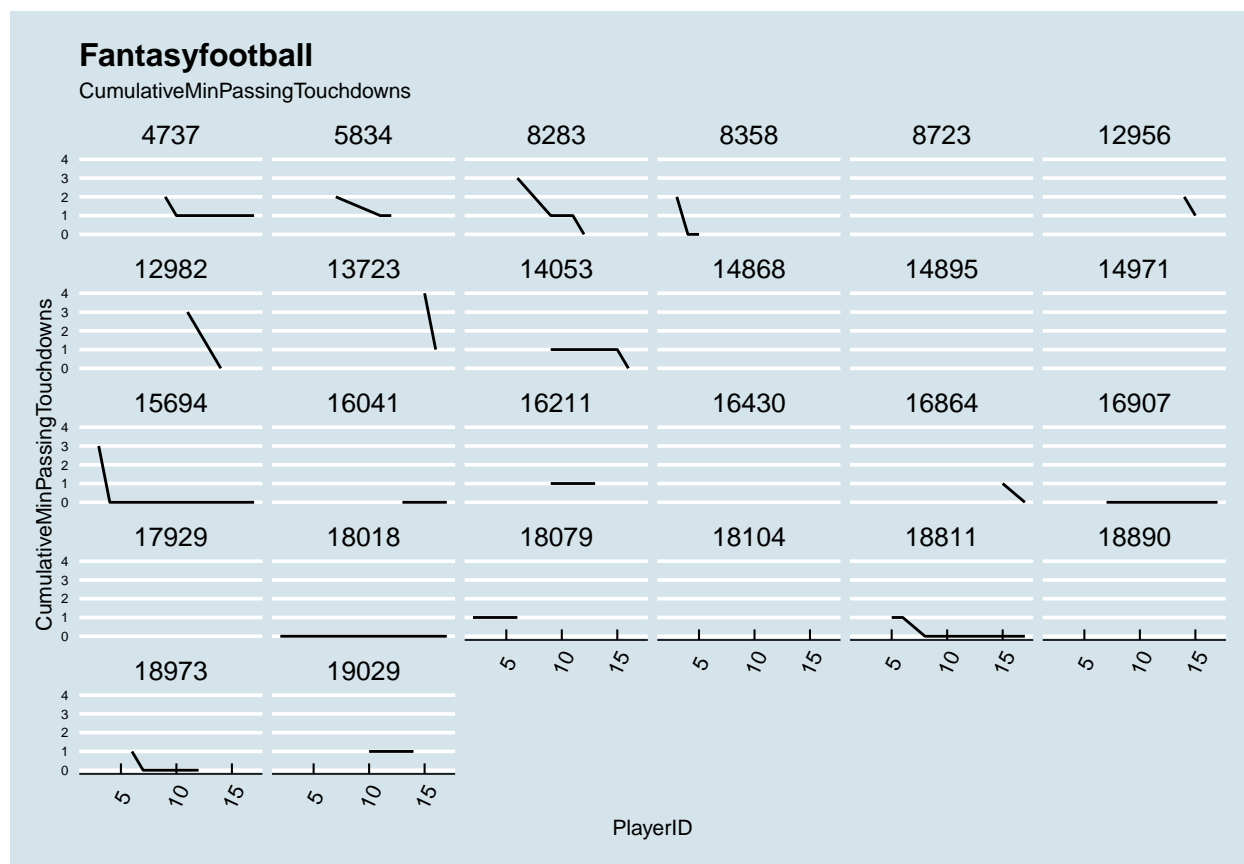




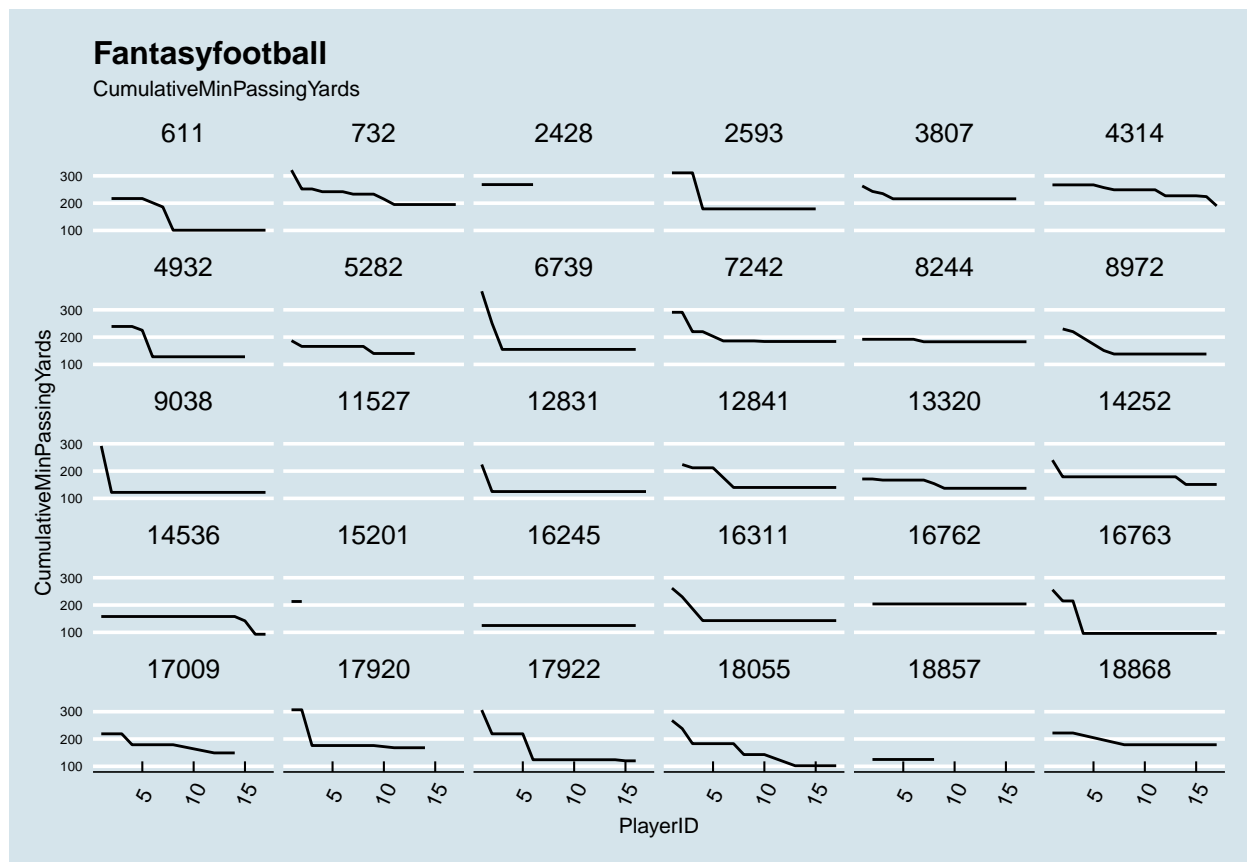
```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```



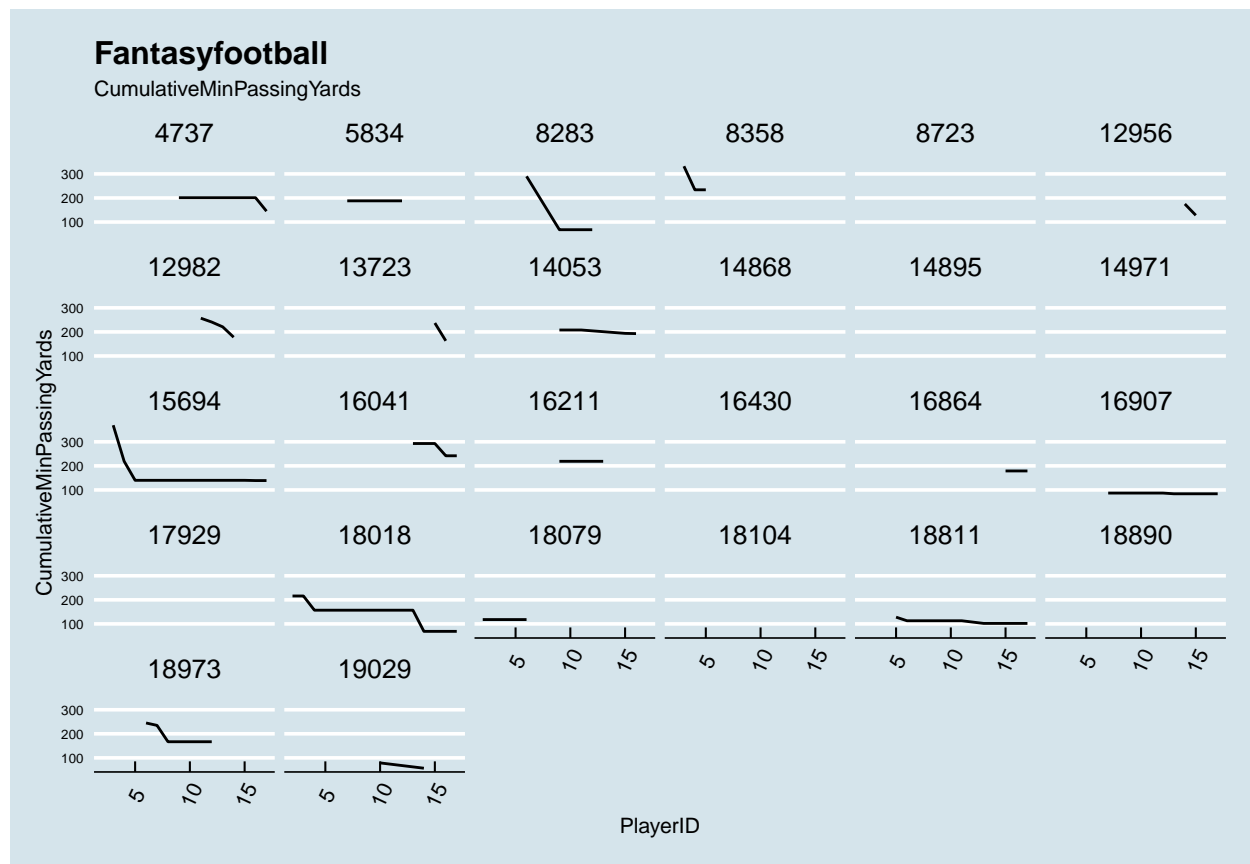
```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
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## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```



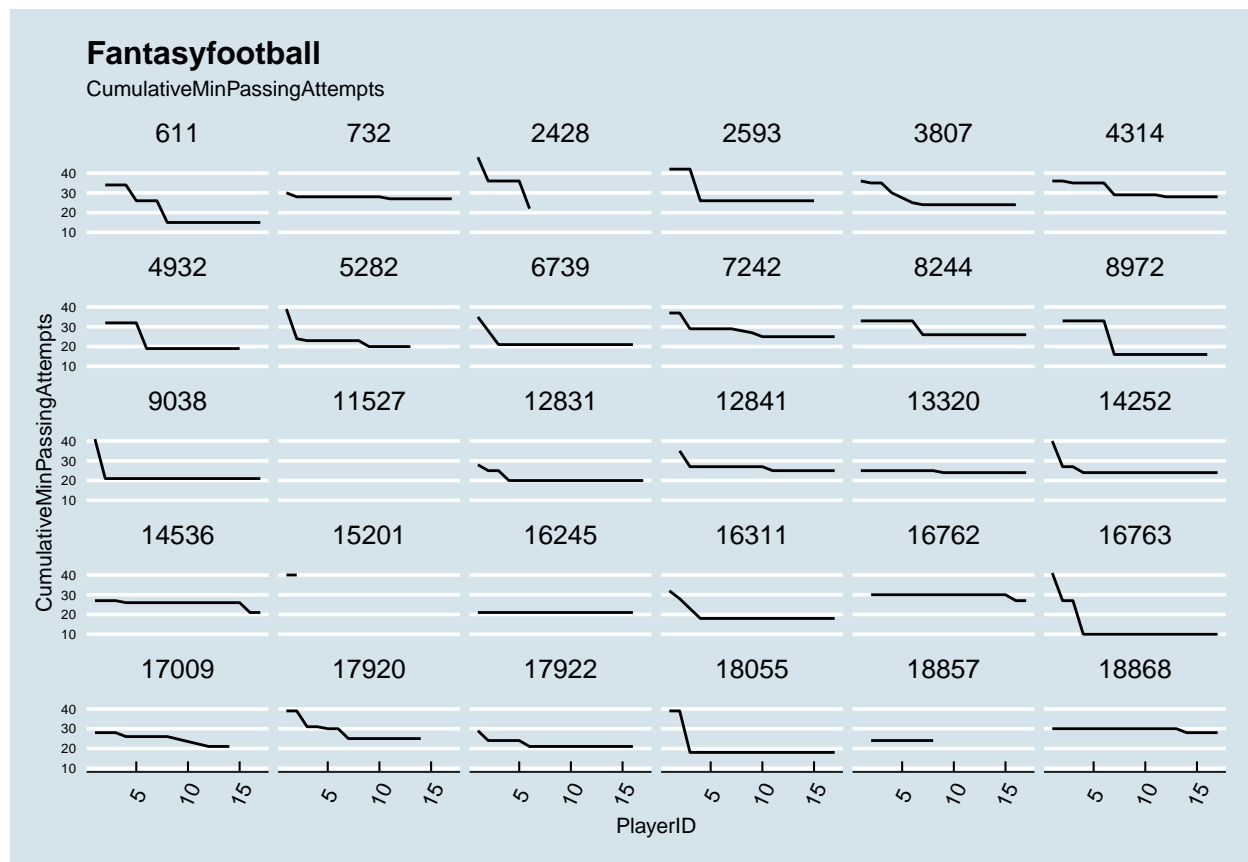
```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```



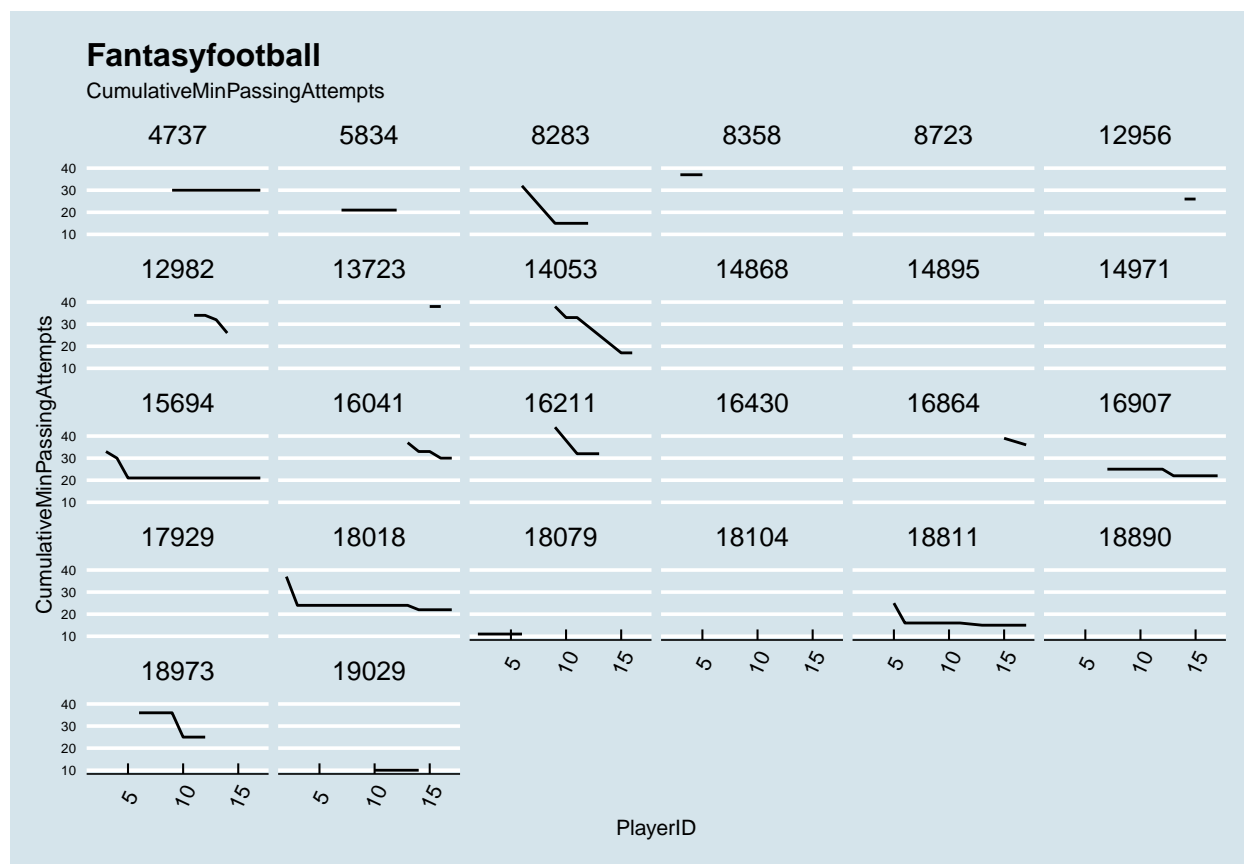
```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
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## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```



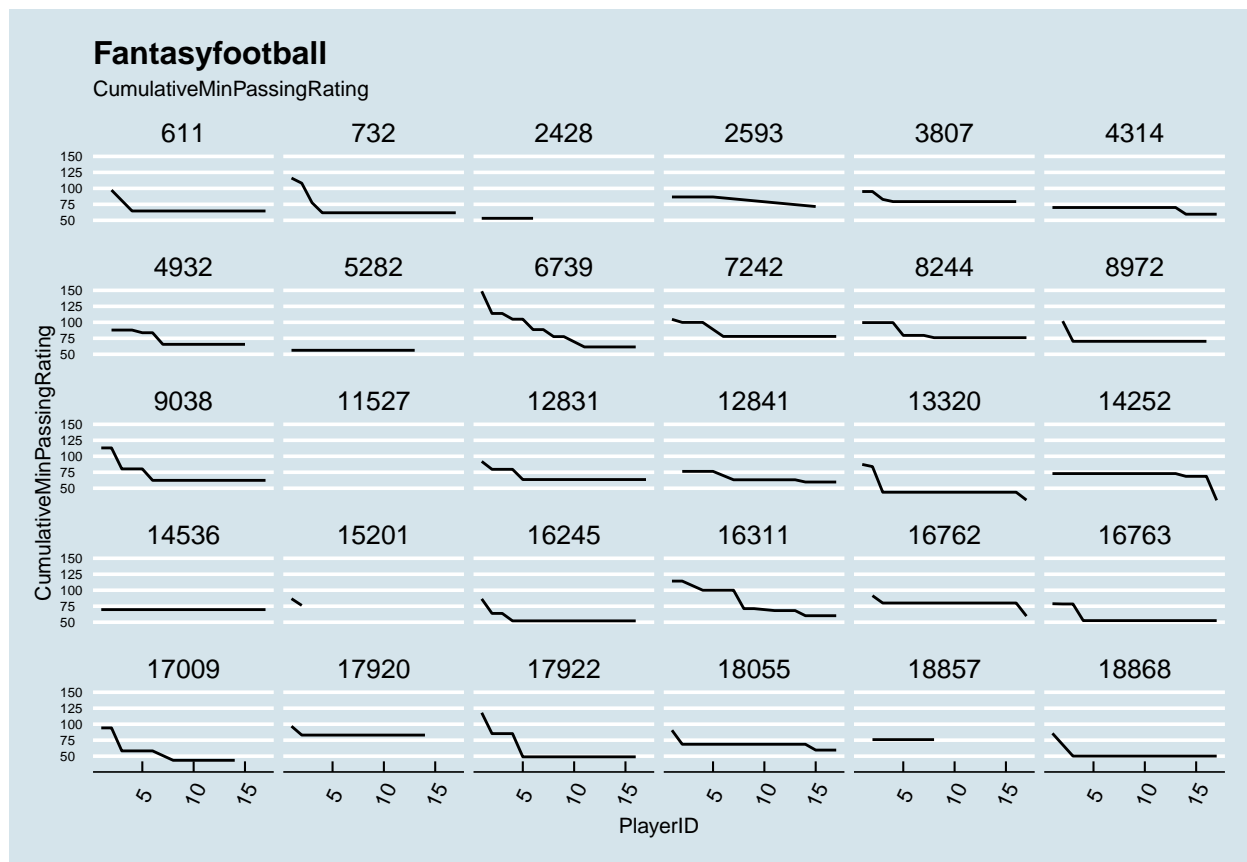
```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```



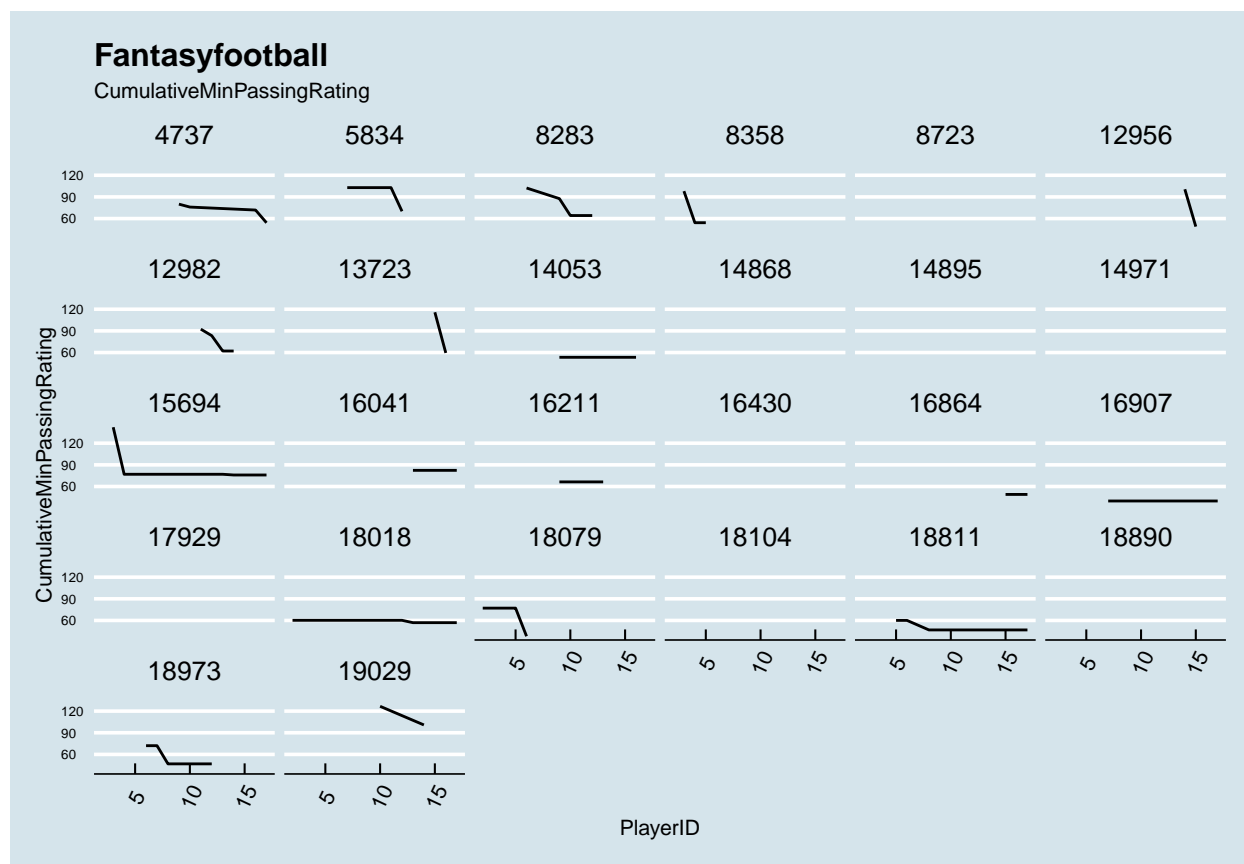
```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
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## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```



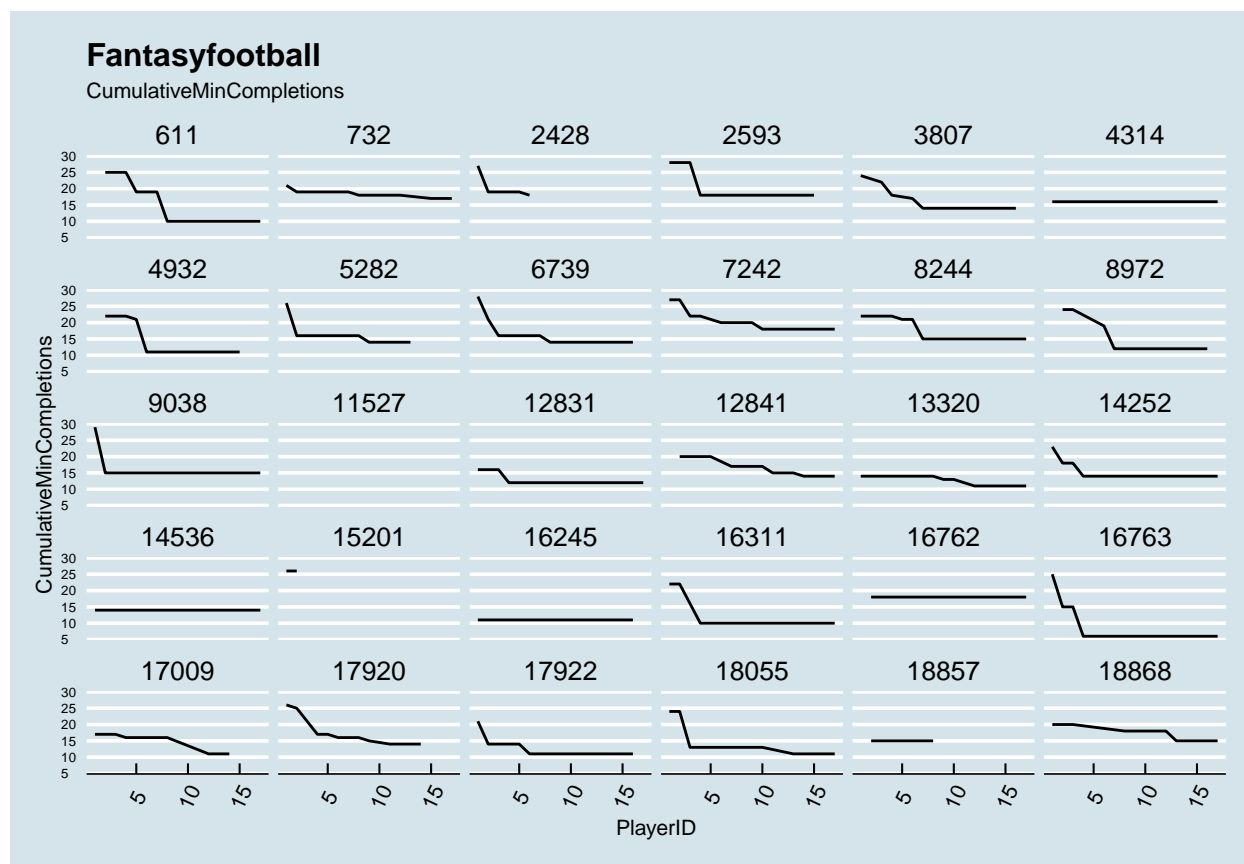
```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```



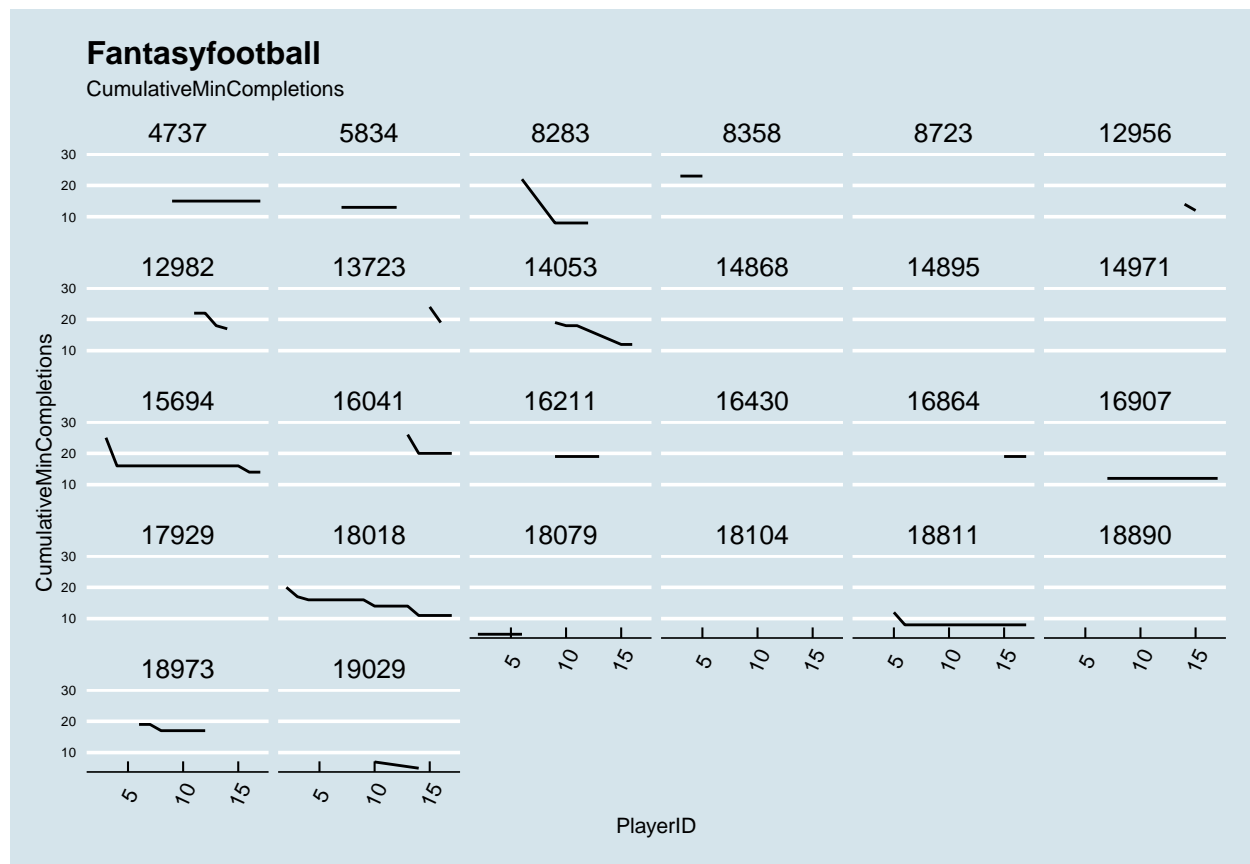




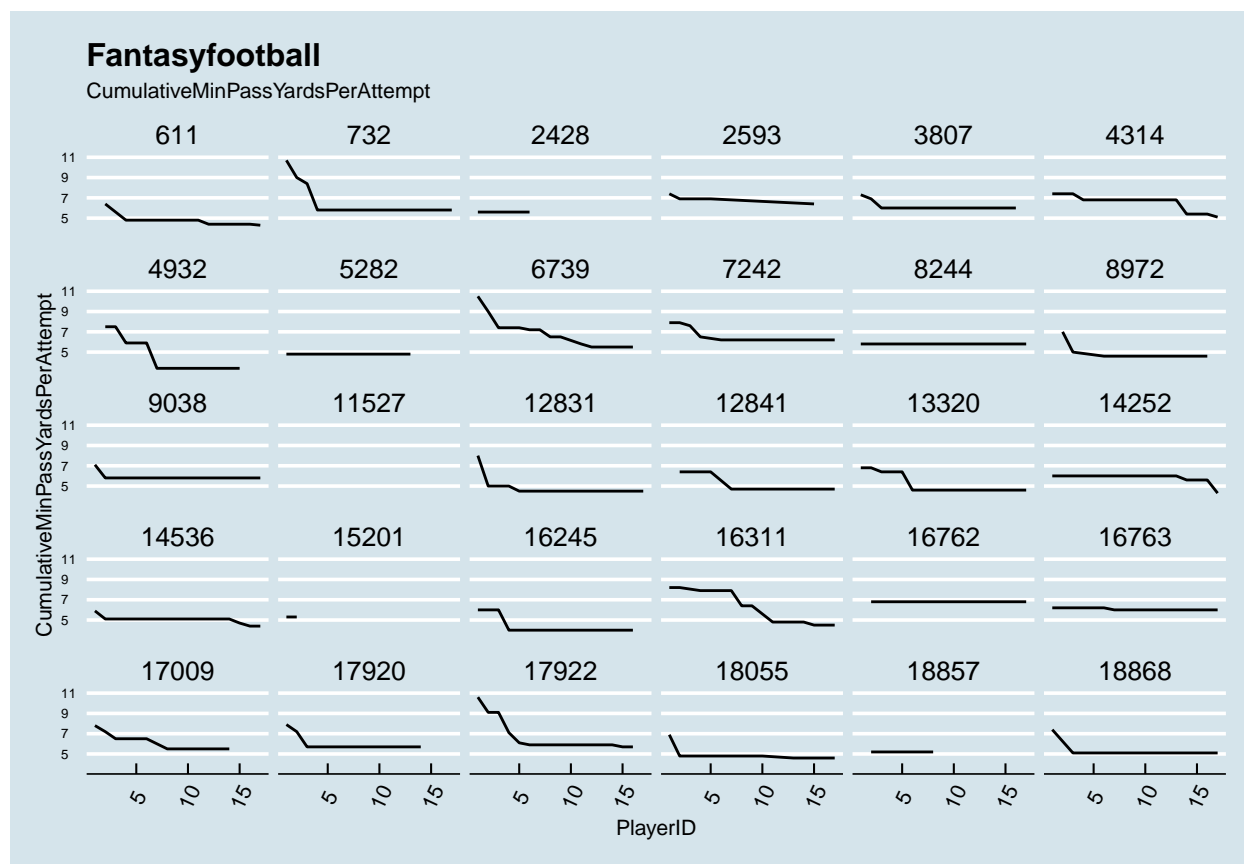
```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```



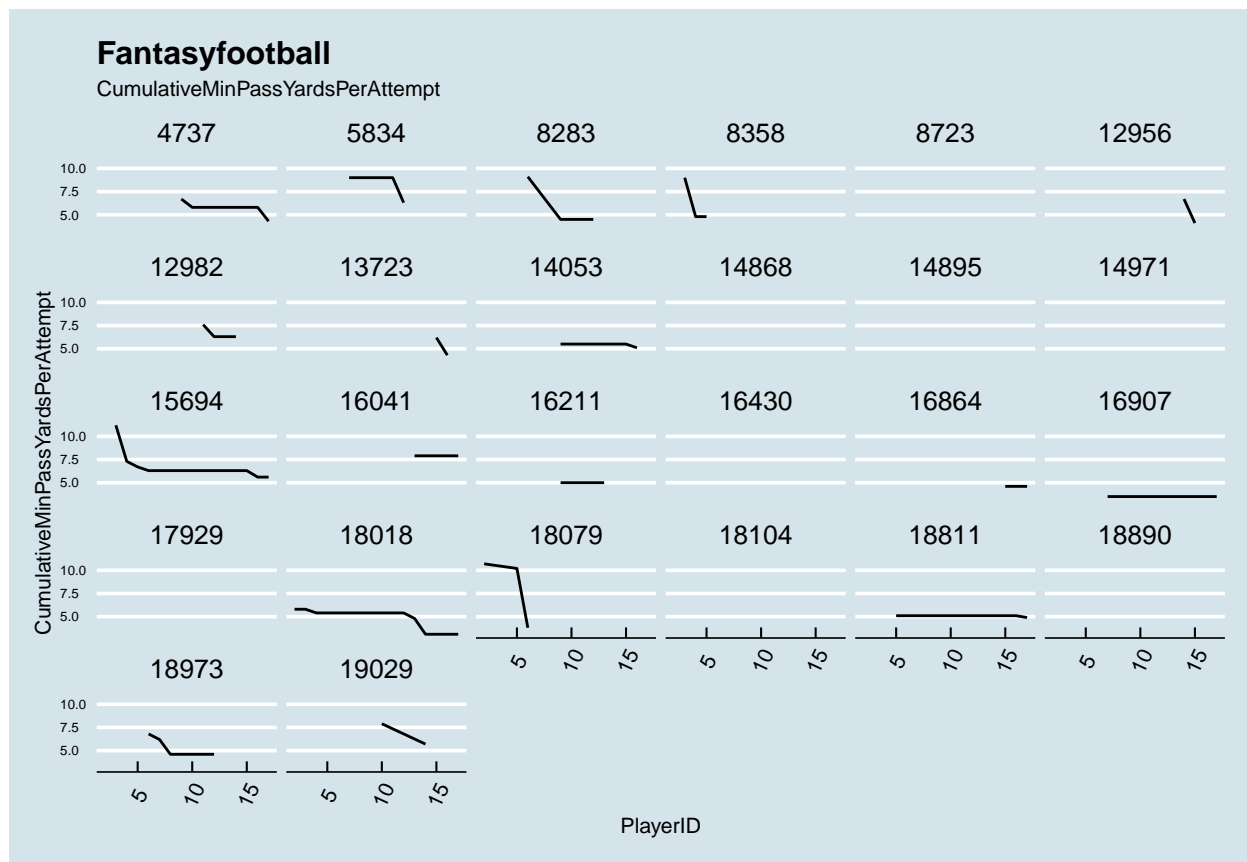
```
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
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```



```
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## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to
## adjust the group aesthetic?
```



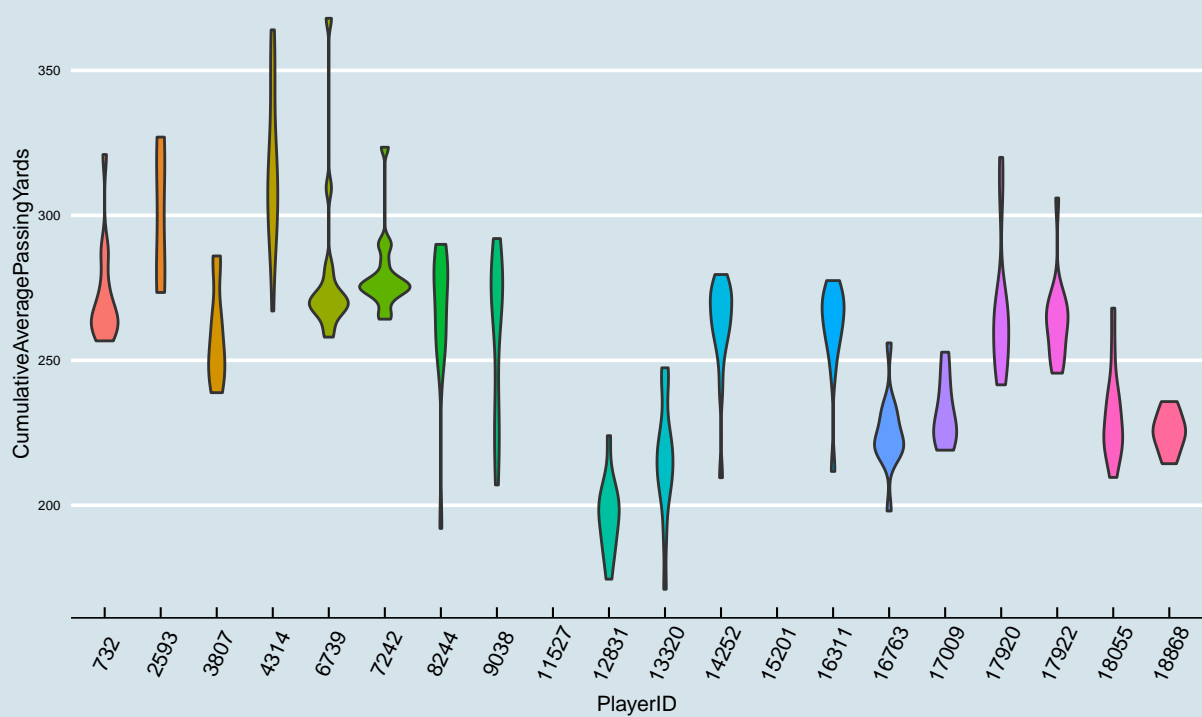
### 1.7.5 Individuals Violin plots for cumulative averages

```
for(p in 37:51){
  #print(paste("violin plots for ",names(players_ds[p])))
  for (player in seq(1,length(unique(final_ds$PlayerID)),by=20)){
    a_size <- player + 19
    players_ds <- final_ds %>% filter(PlayerID %in% unique(final_ds$PlayerID)[player:a_size])

    v_plot <- players_ds %>%
      ggplot(aes_string(x="as.factor(PlayerID)",y=names(players_ds[p]),fill="as.factor(Play
      ggtitle(names(players_ds[p]))+
      geom_violin(show.legend = FALSE)+
        xlab("PlayerID")+
        ylab(names(players_ds[p]))+
        labs(title="Fantasyfootball",
        subtitle=names(players_ds[p]),
        aption="Source: Fantasyfootball")+
        theme_economist(base_size=8)+theme(axis.text.y = element_text(size=5))+
        theme(axis.text.x = element_text(angle=65, vjust=0.6))
    print(v_plot)
  }
}
```

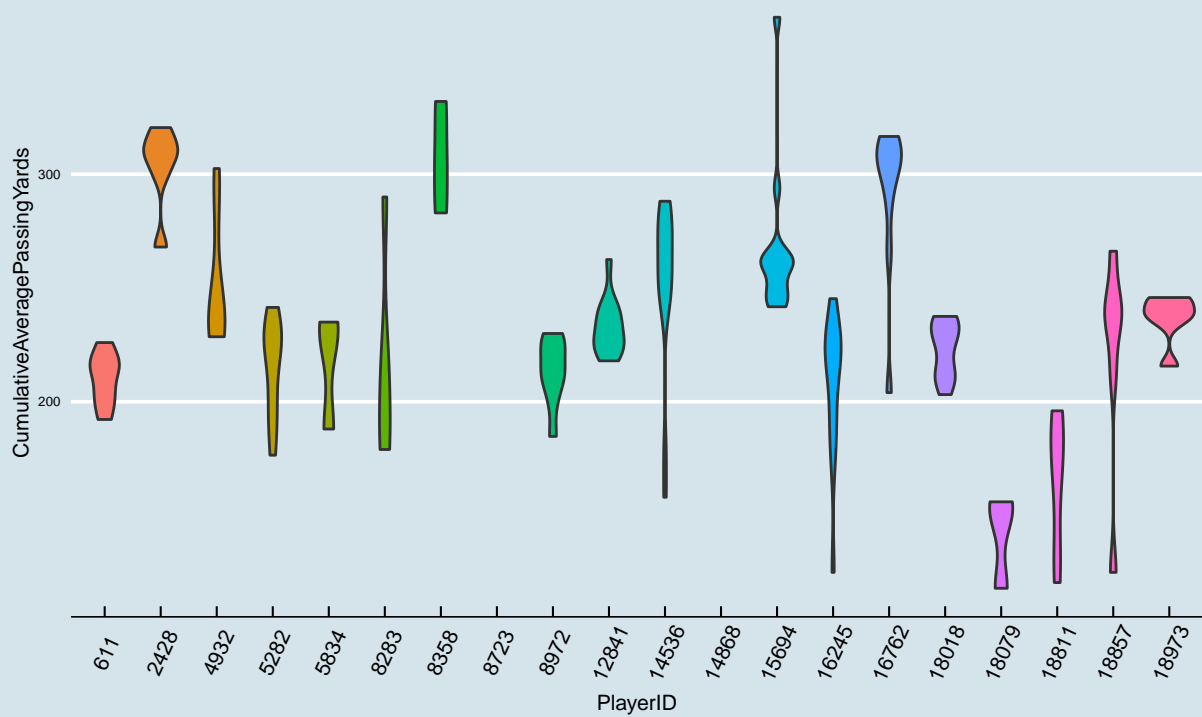
## Fantasyfootball

CumulativeAveragePassingYards



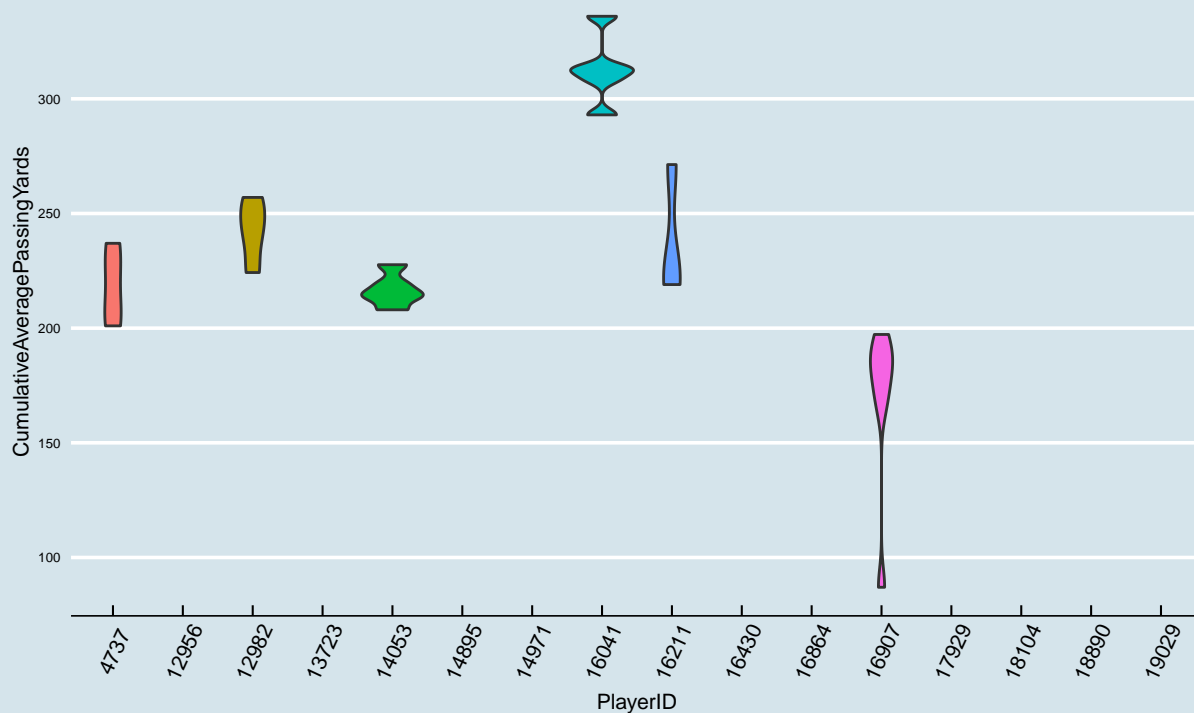
## Fantasyfootball

CumulativeAveragePassingYards



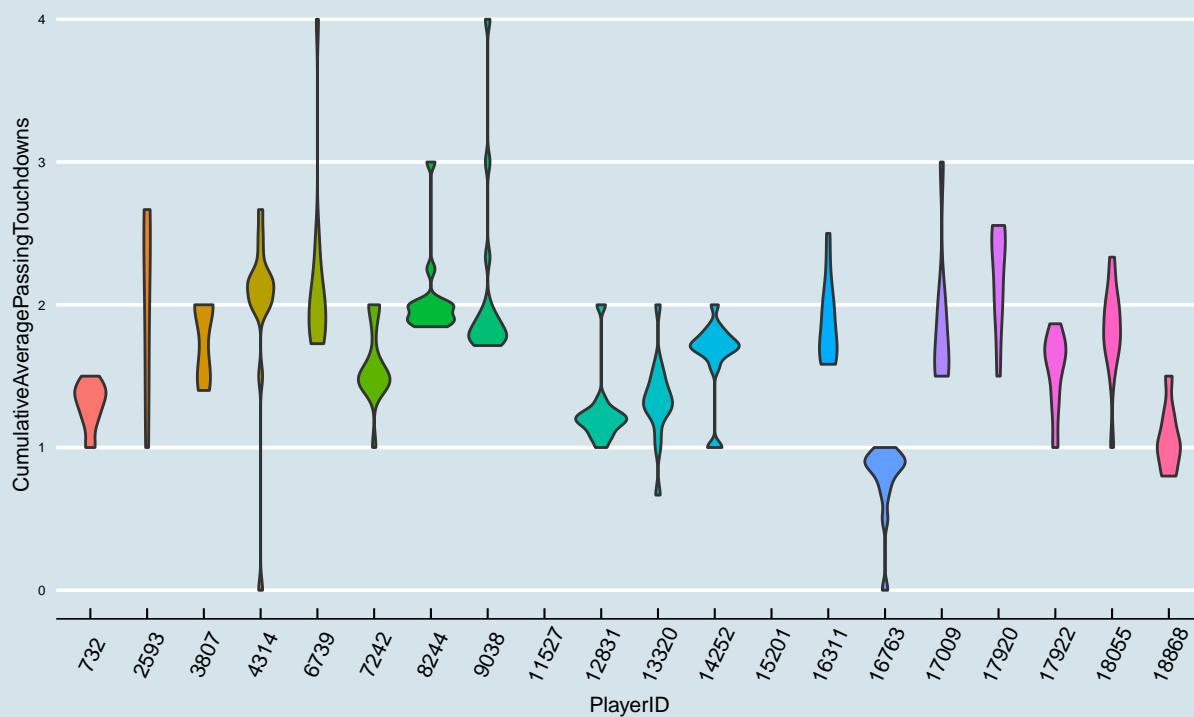
## Fantasyfootball

CumulativeAveragePassingYards



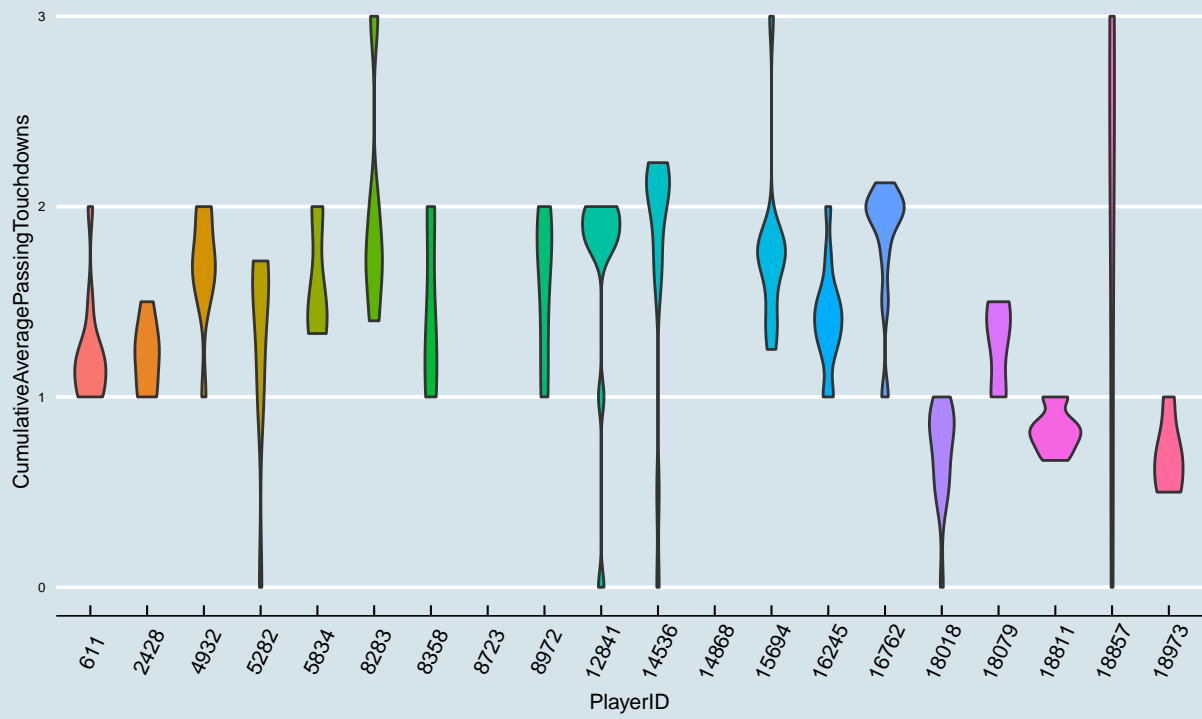
## Fantasyfootball

CumulativeAveragePassingTouchdowns



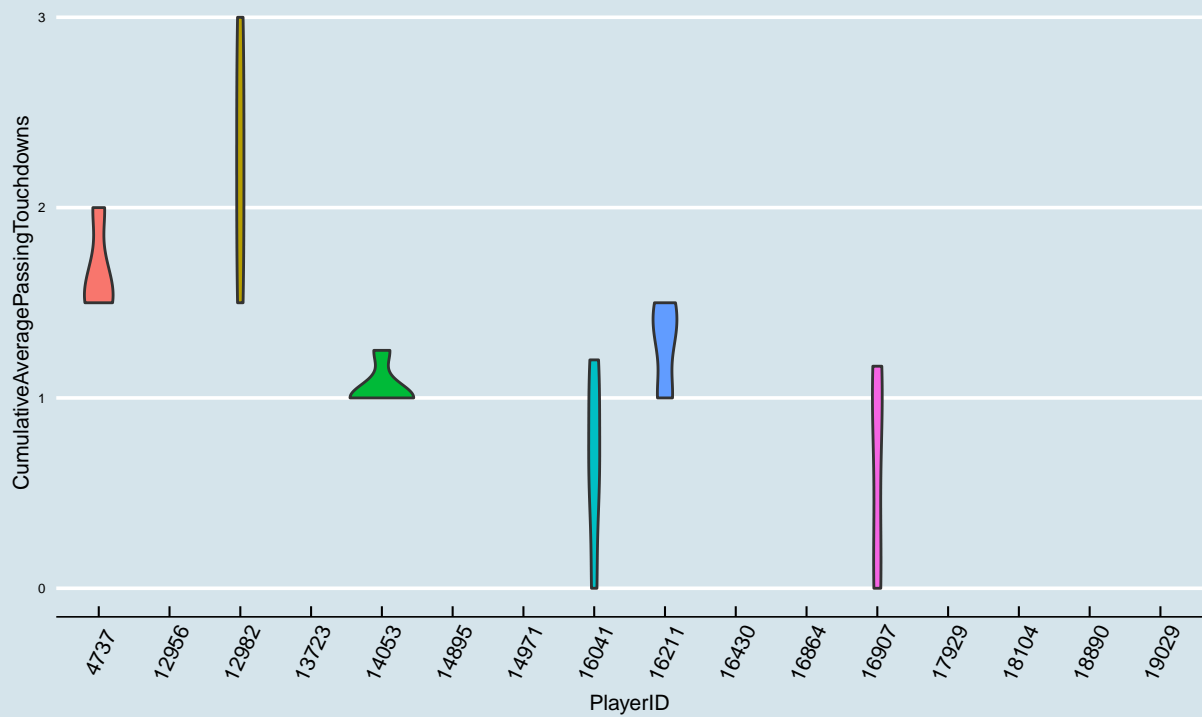
## Fantasyfootball

CumulativeAveragePassingTouchdowns



## Fantasyfootball

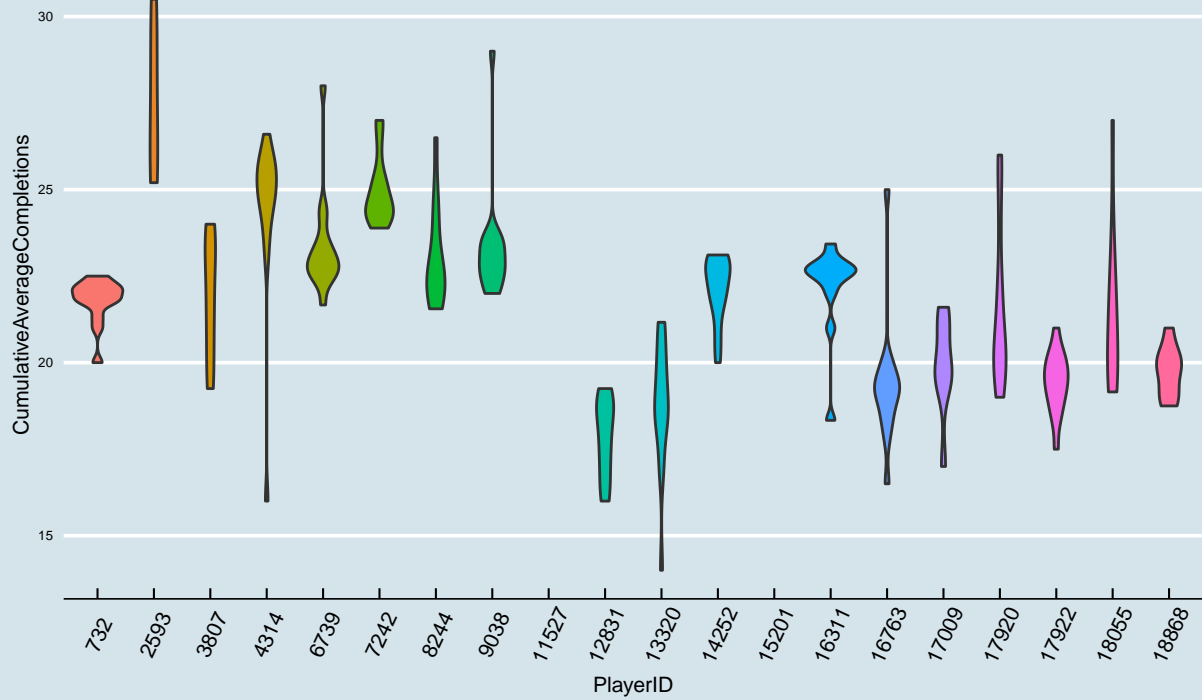
CumulativeAveragePassingTouchdowns





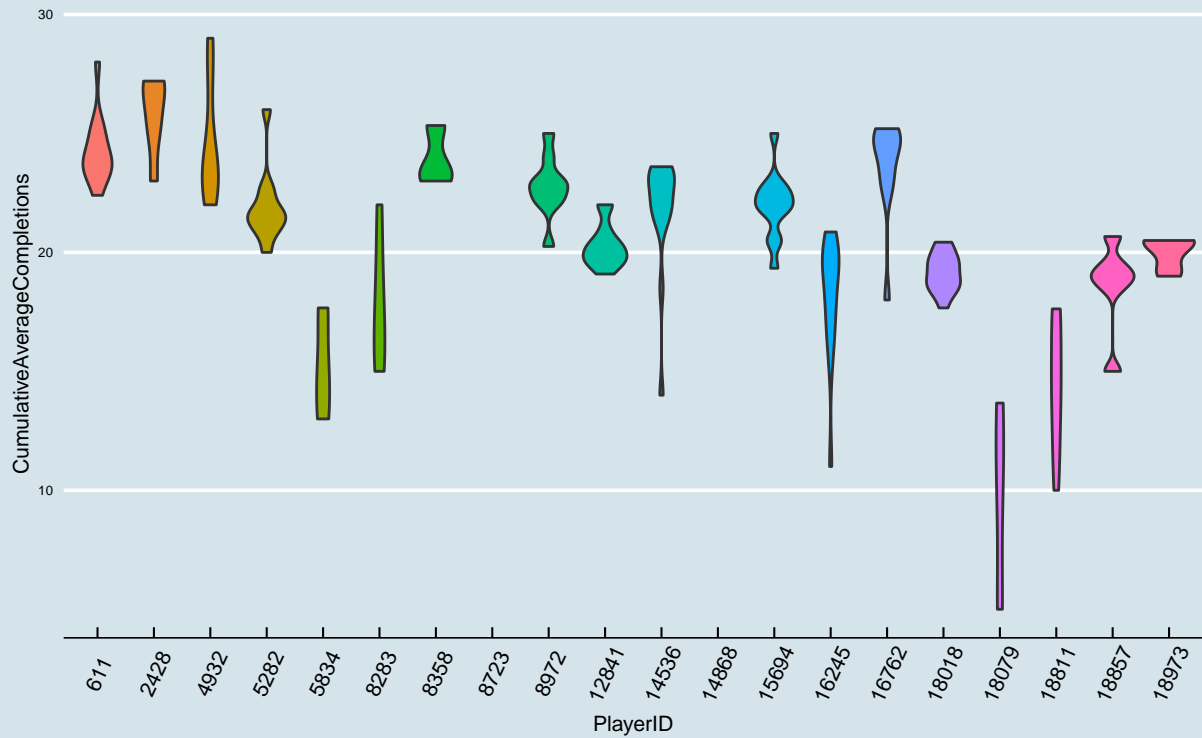
## Fantasyfootball

CumulativeAverageCompletions



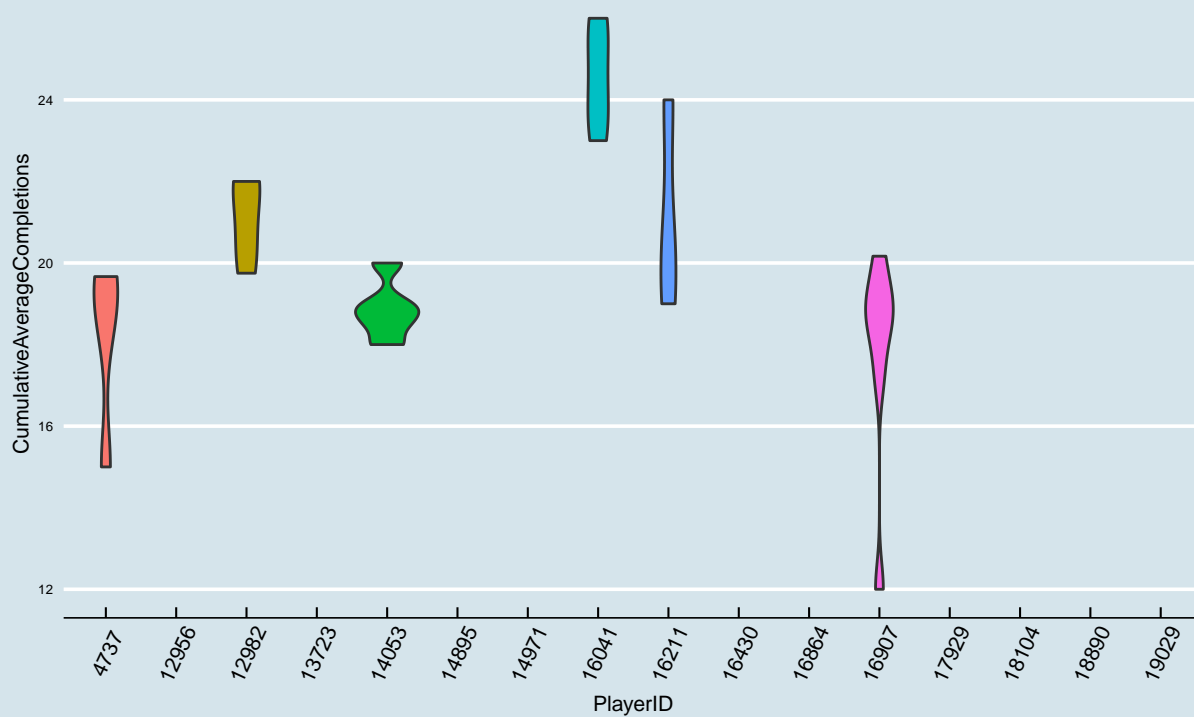
## Fantasyfootball

CumulativeAverageCompletions



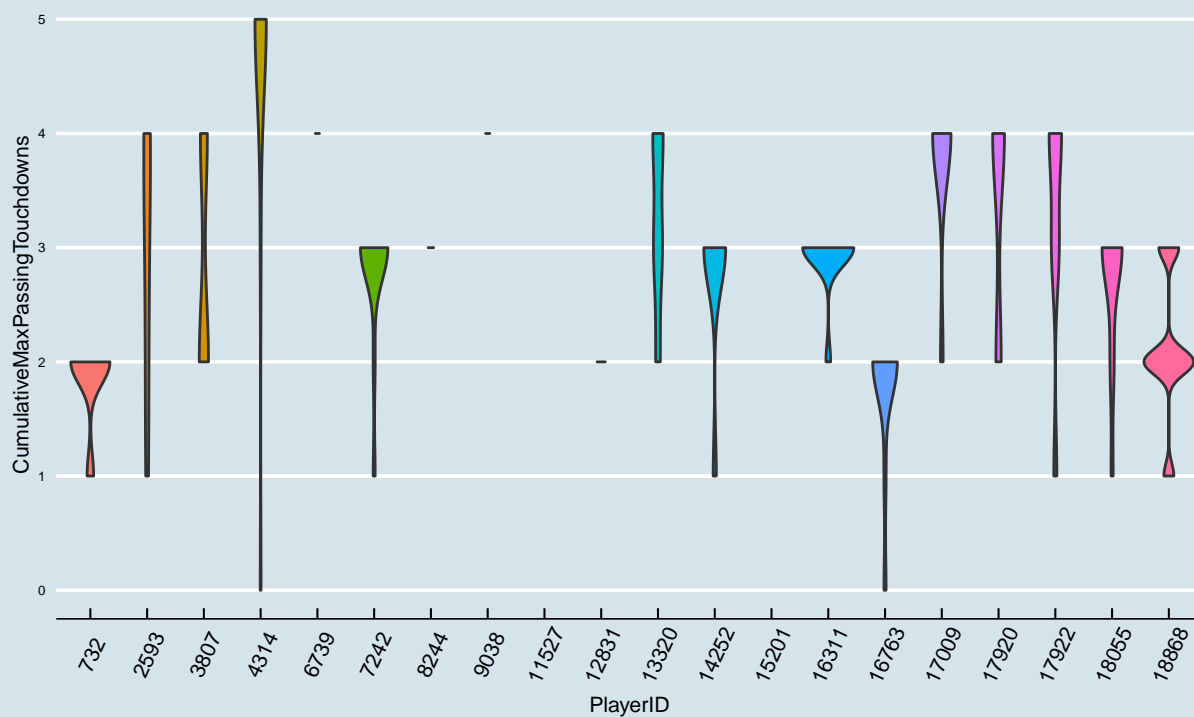
## Fantasyfootball

CumulativeAverageCompletions



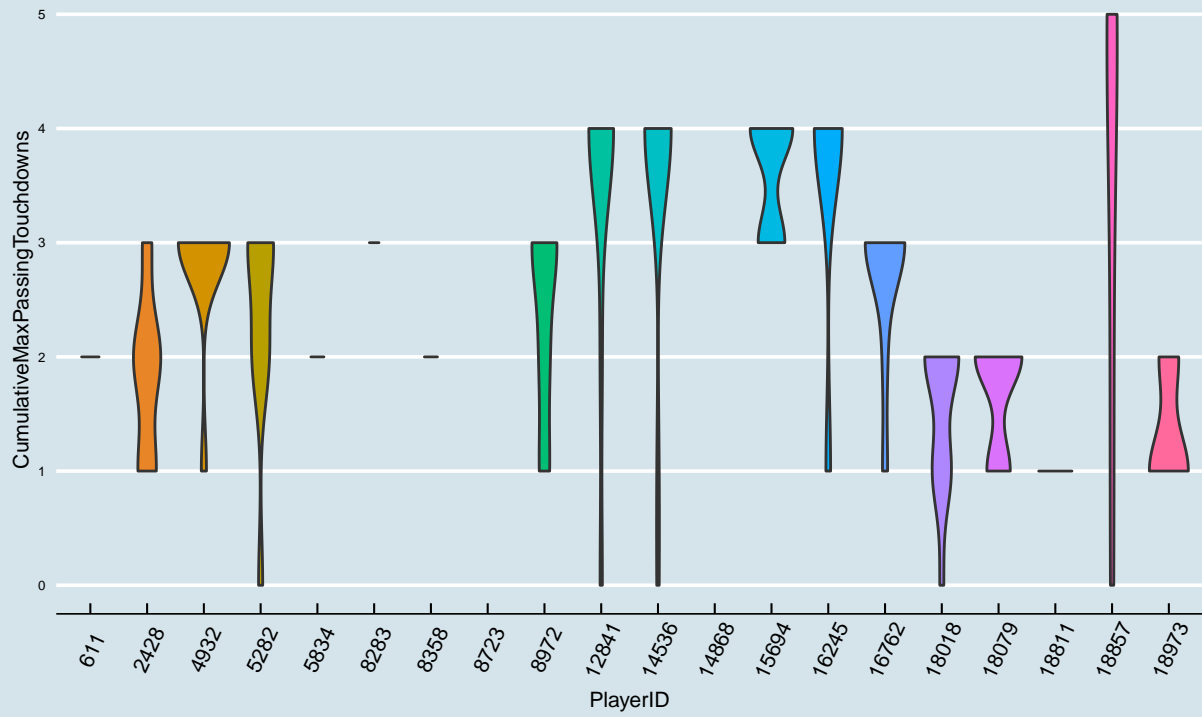
## Fantasyfootball

CumulativeMaxPassingTouchdowns



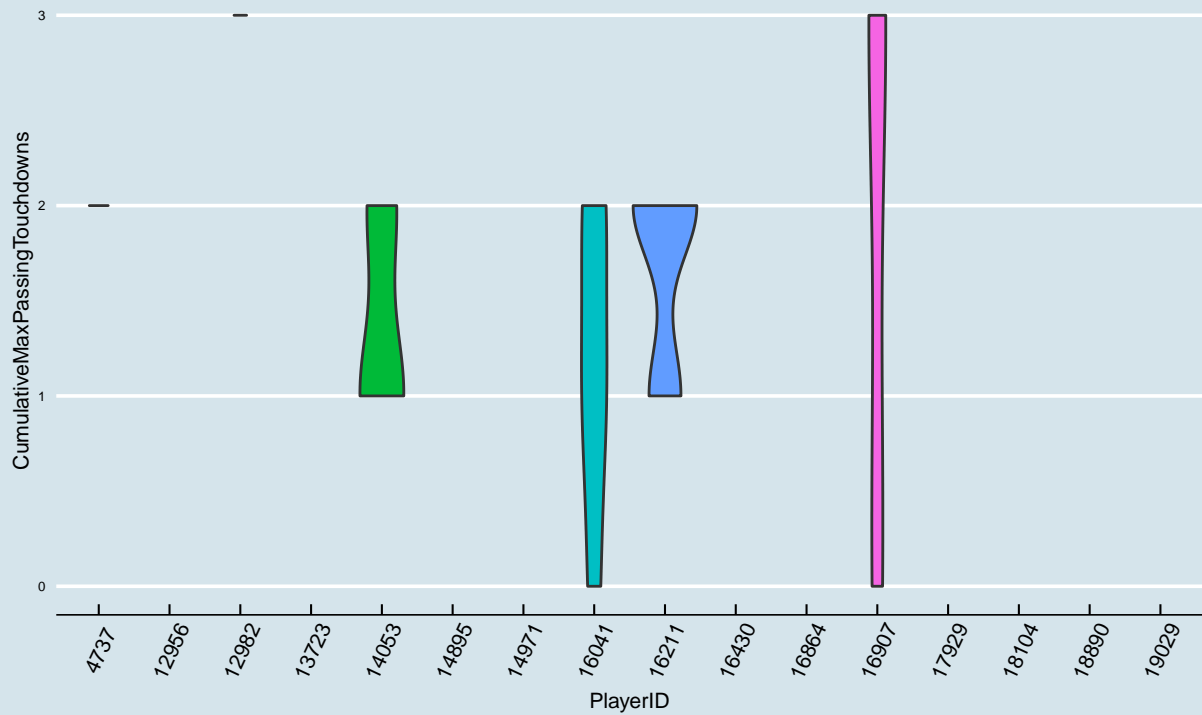
## Fantasyfootball

CumulativeMaxPassingTouchdowns



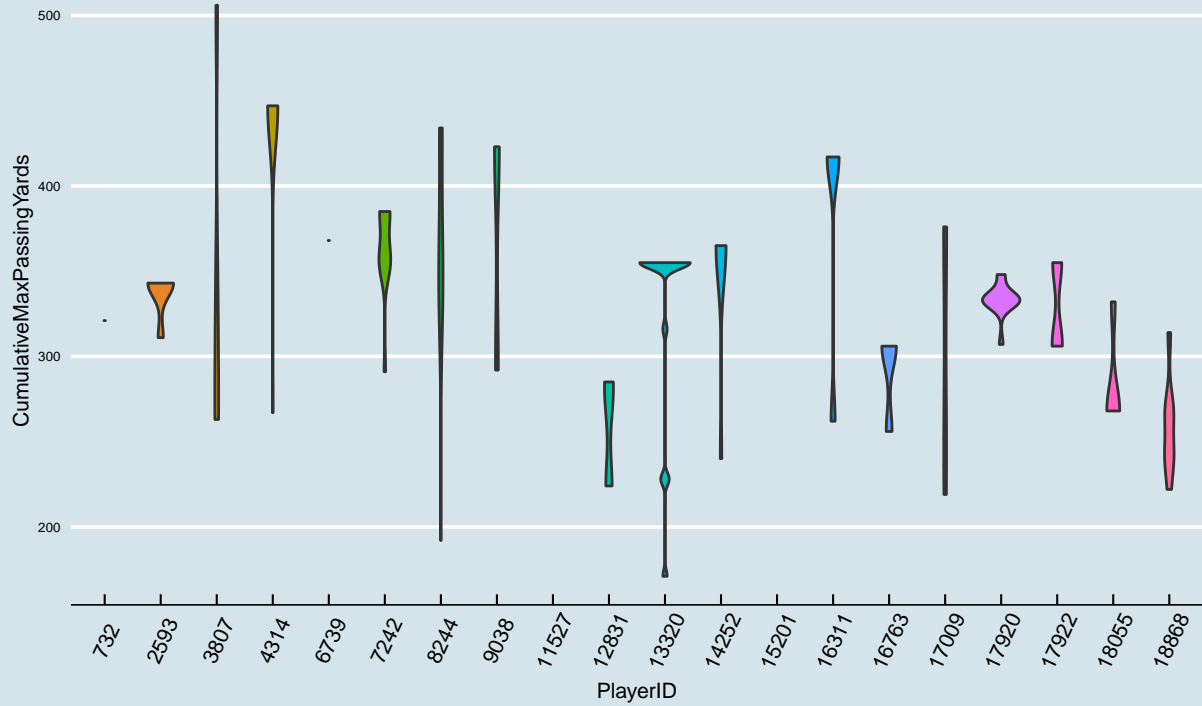
## Fantasyfootball

CumulativeMaxPassingTouchdowns



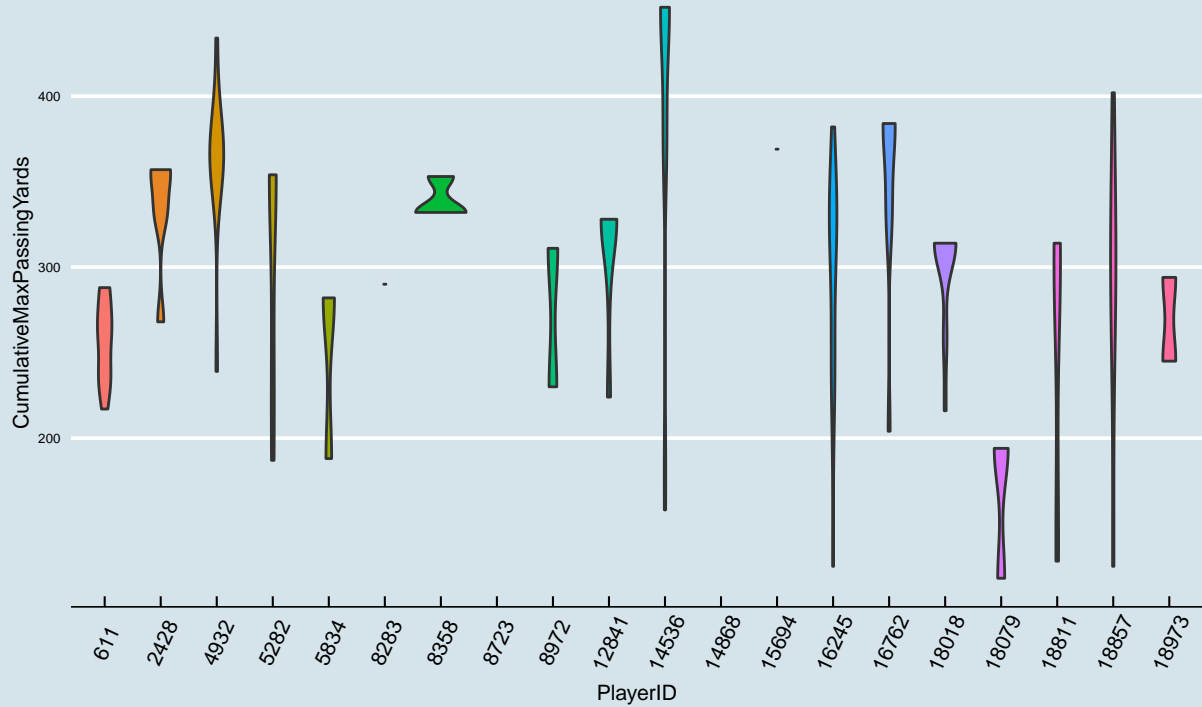
## Fantasyfootball

CumulativeMaxPassingYards



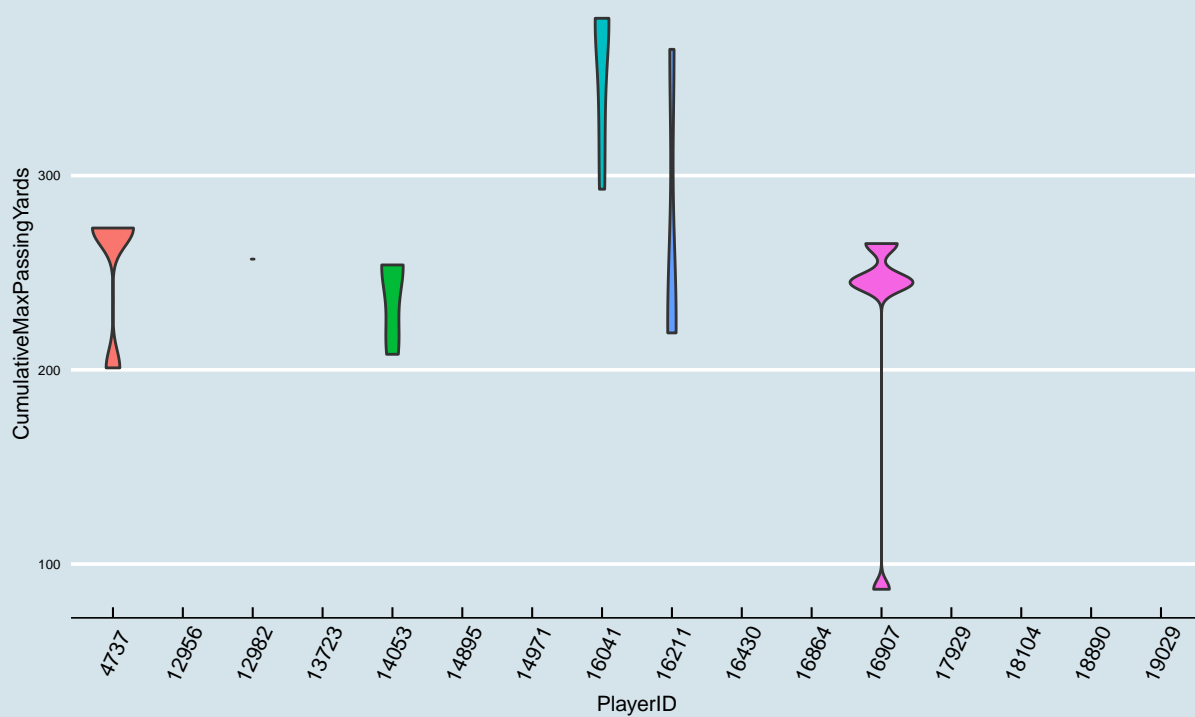
## Fantasyfootball

CumulativeMaxPassingYards



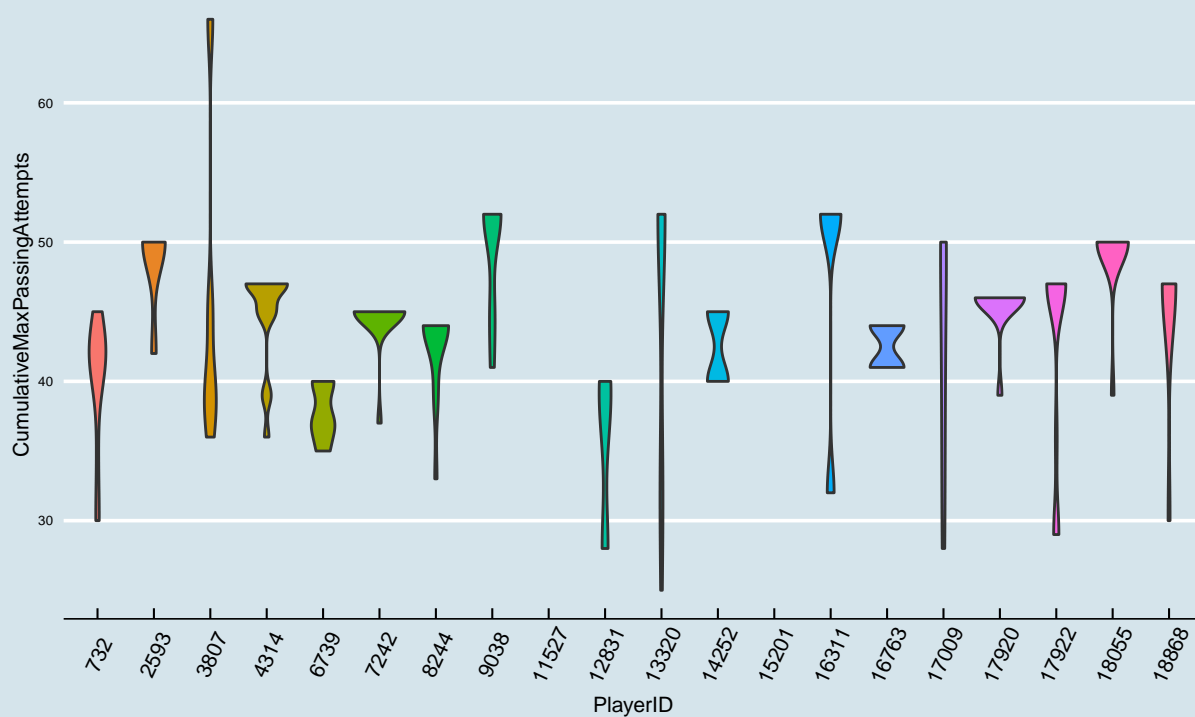
## Fantasyfootball

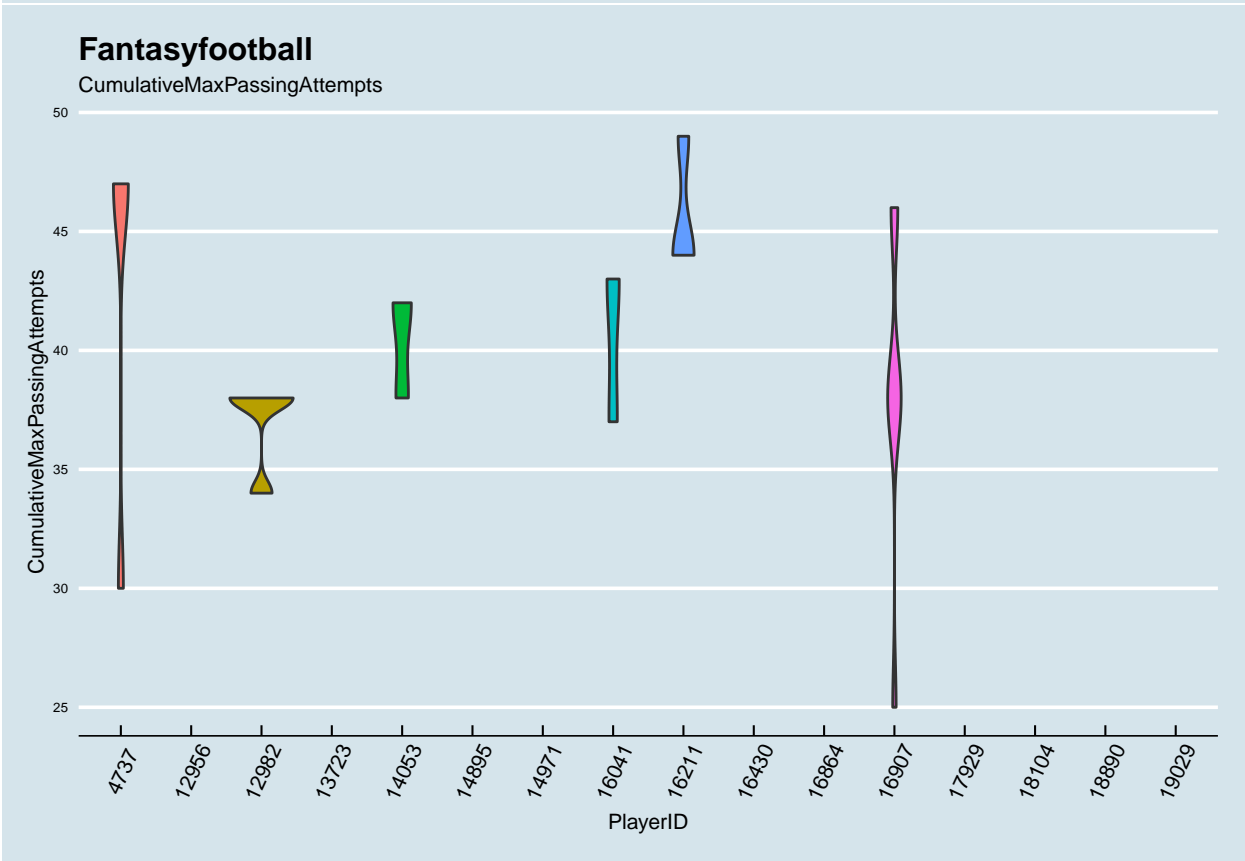
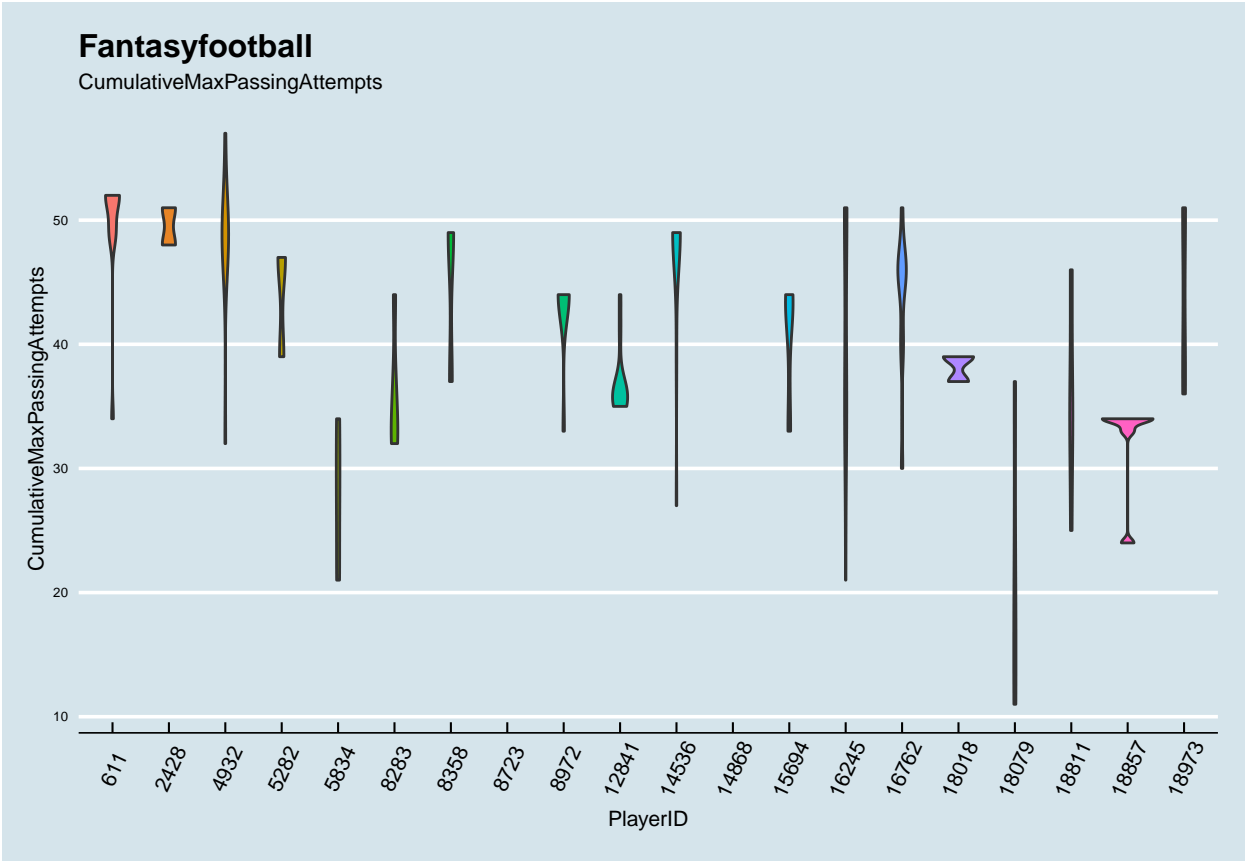
CumulativeMaxPassingYards



## Fantasyfootball

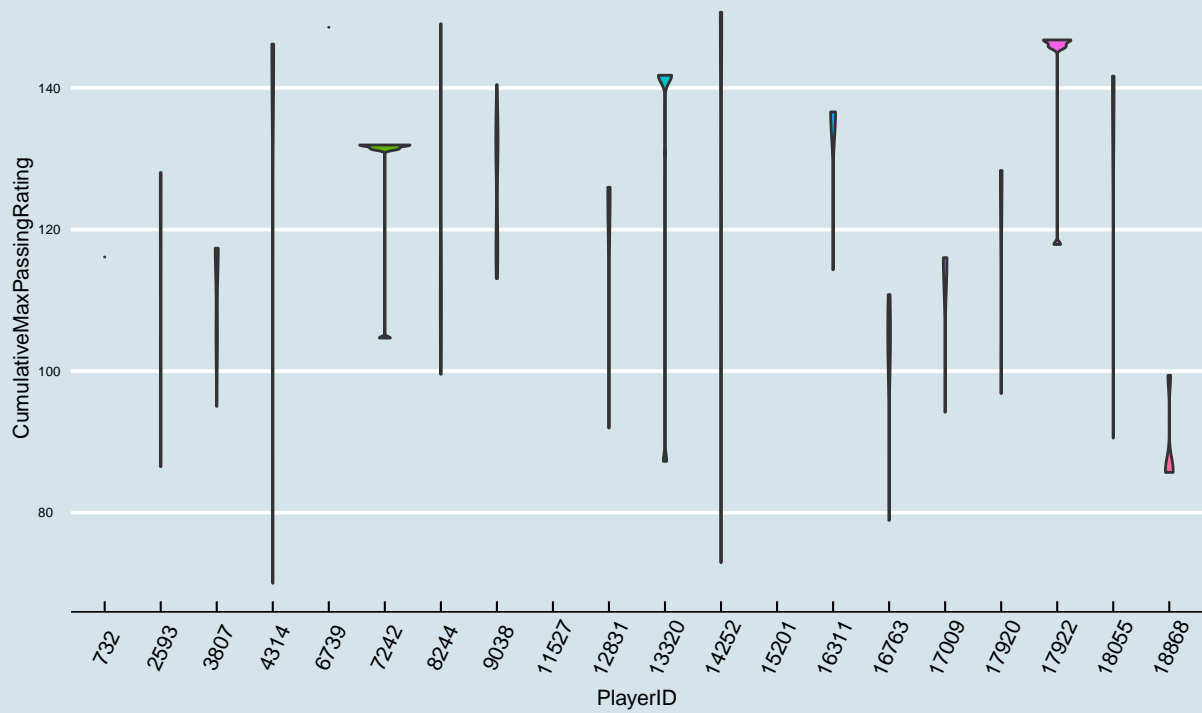
CumulativeMaxPassingAttempts





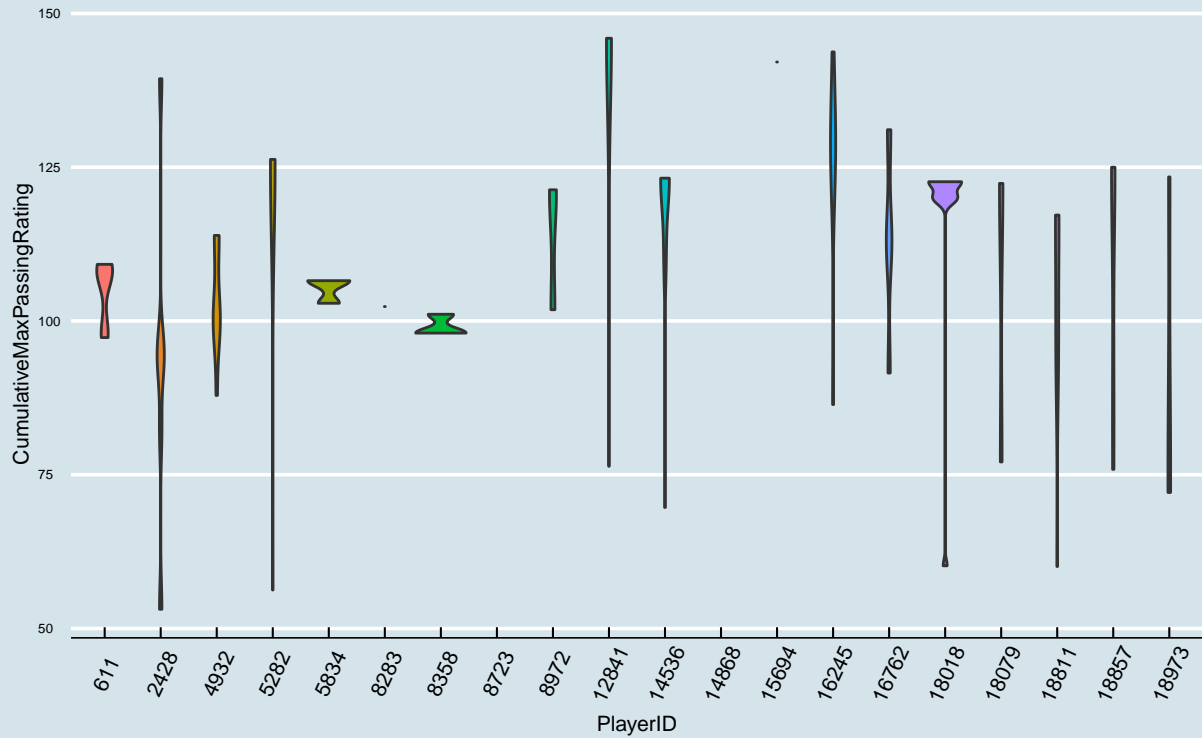
## Fantasyfootball

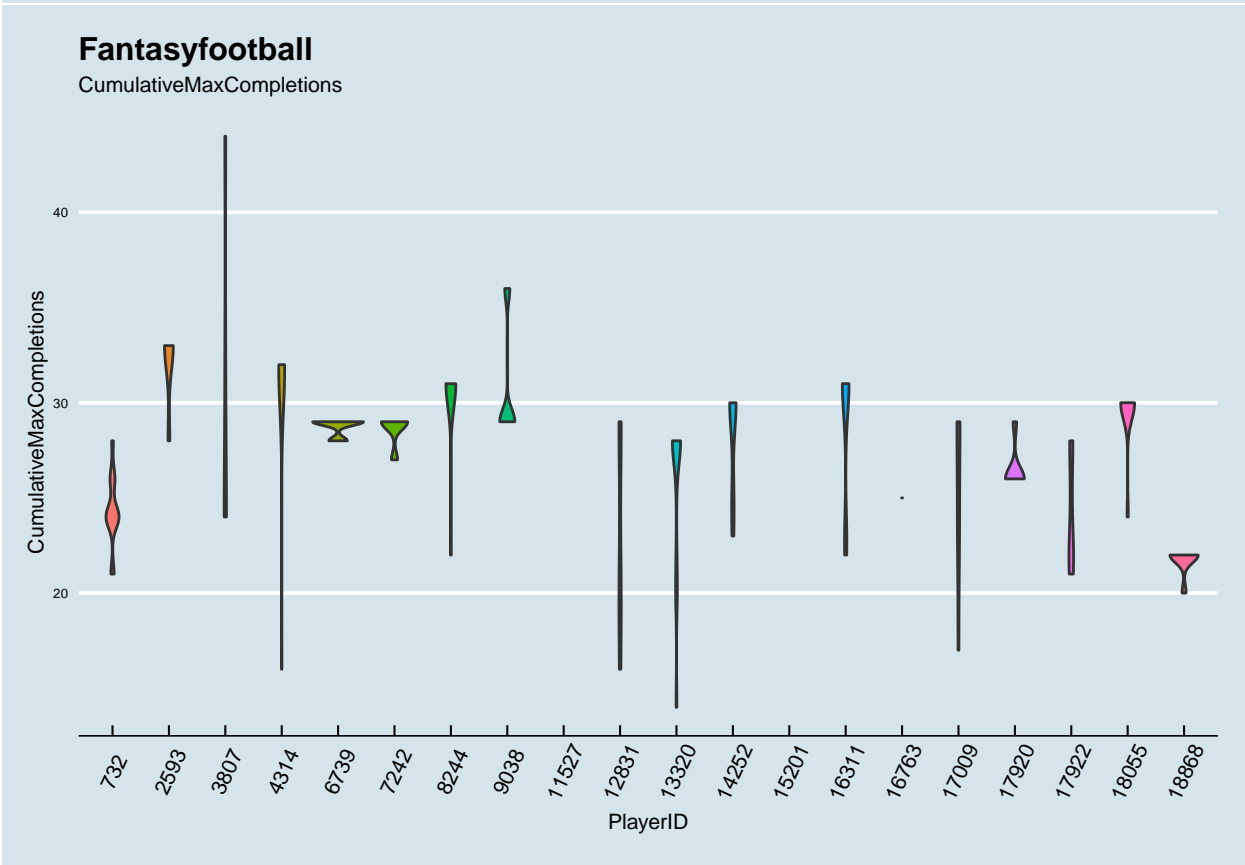
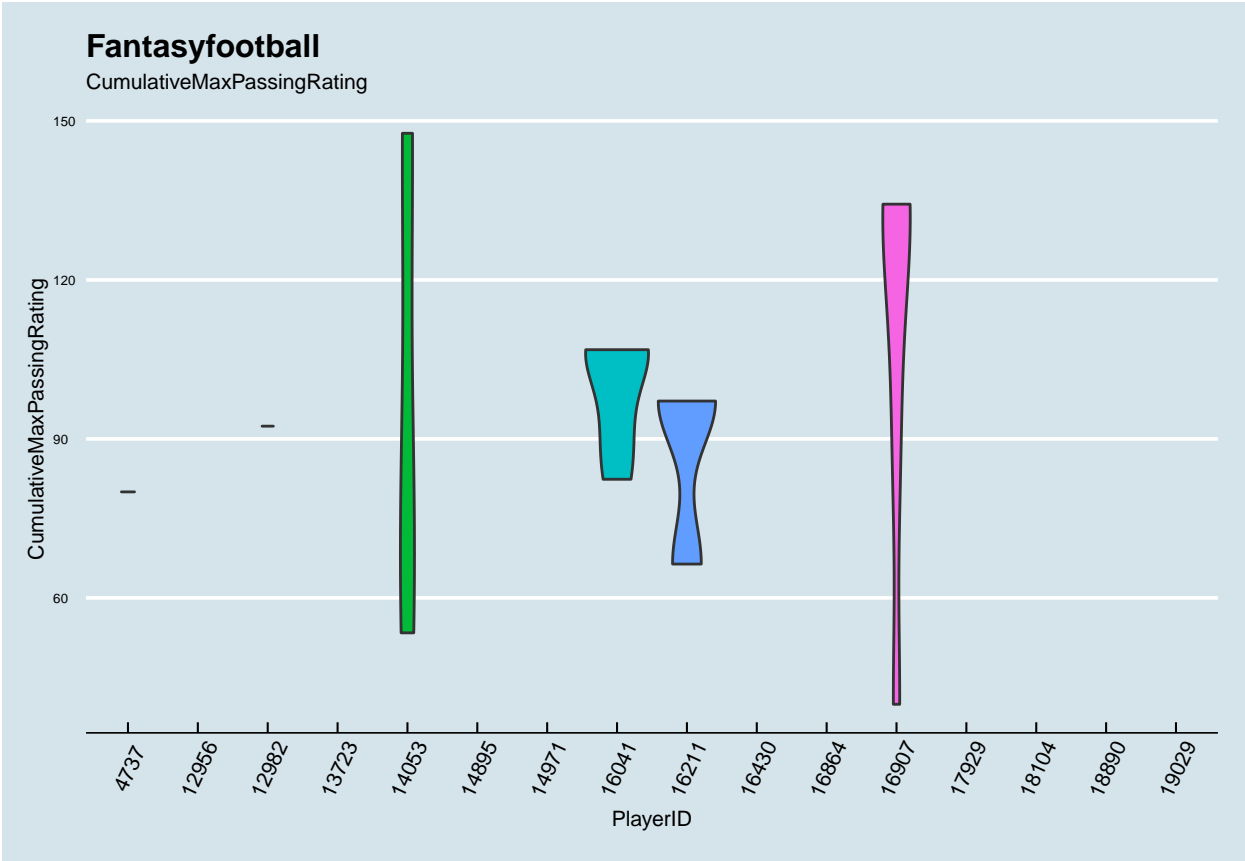
CumulativeMaxPassingRating



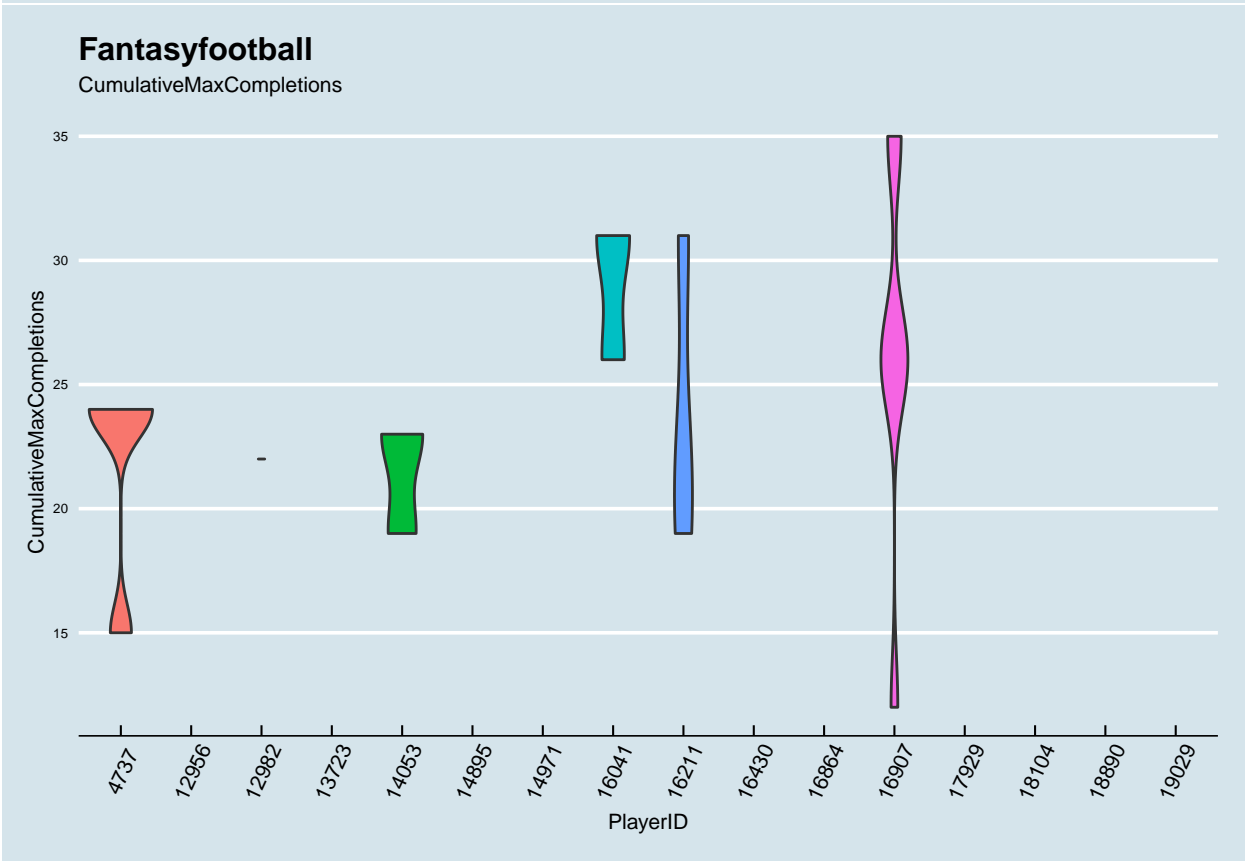
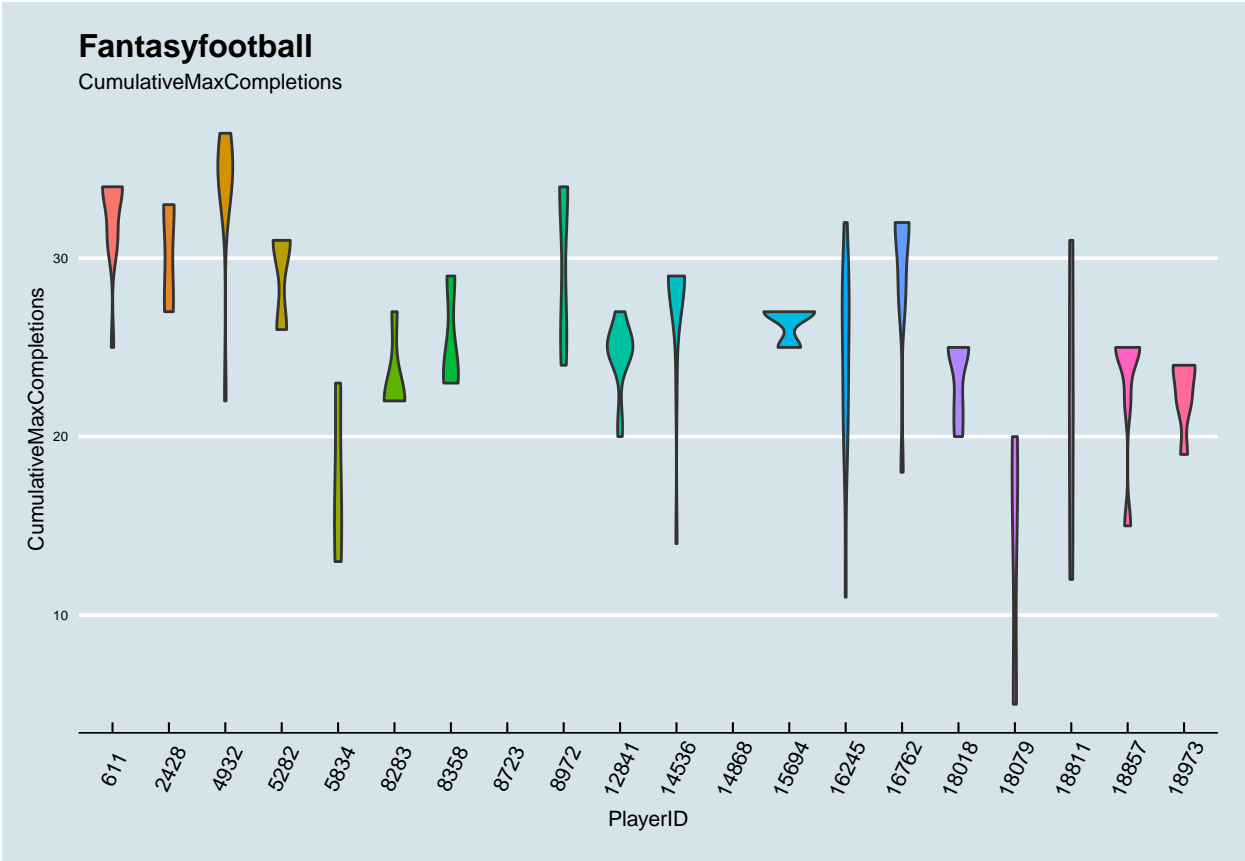
## Fantasyfootball

CumulativeMaxPassingRating



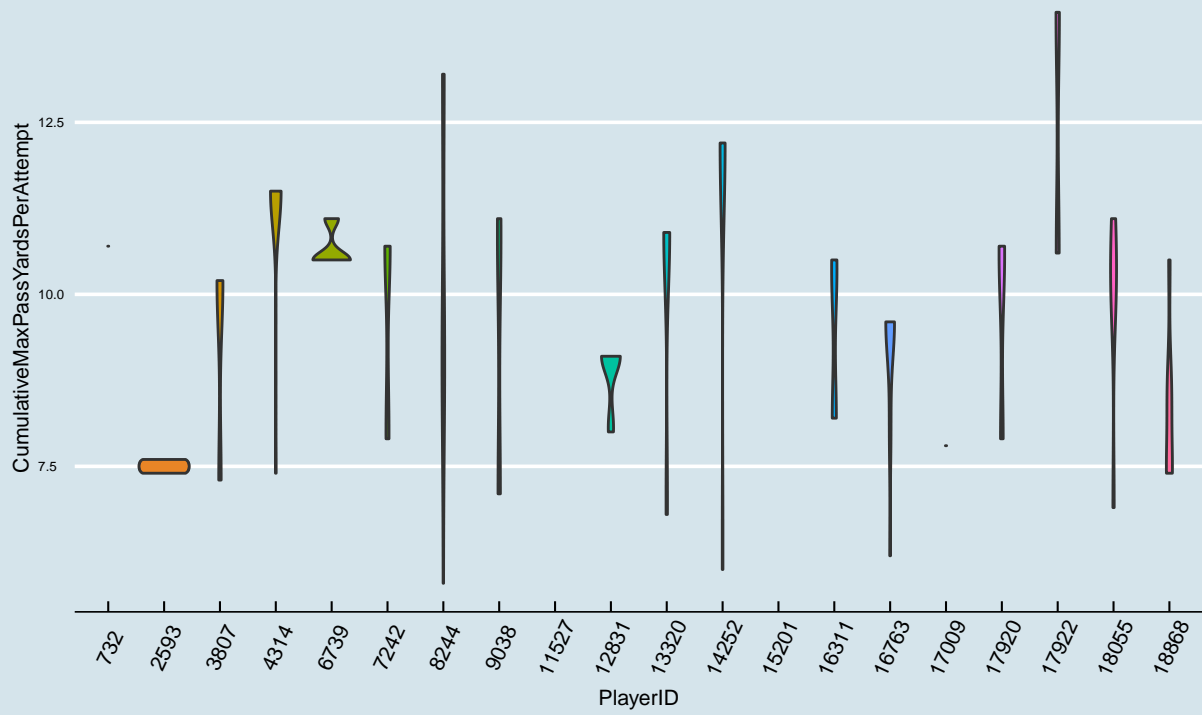






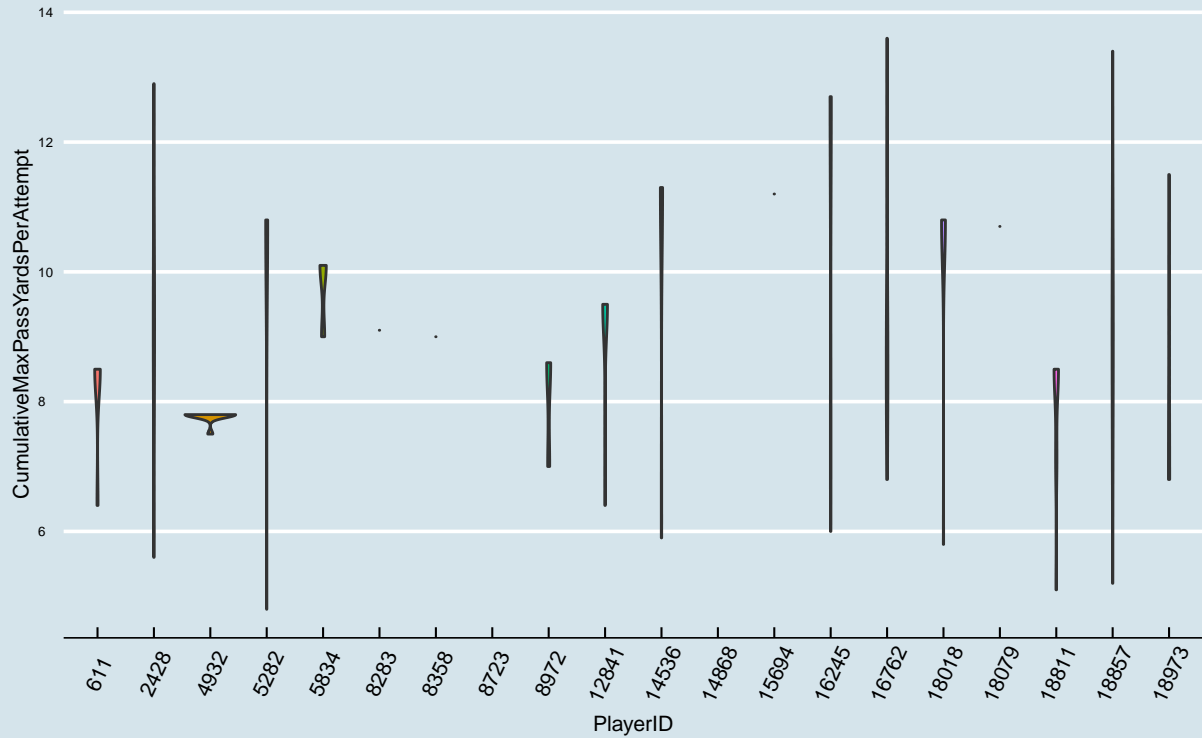
## Fantasyfootball

CumulativeMaxPassYardsPerAttempt



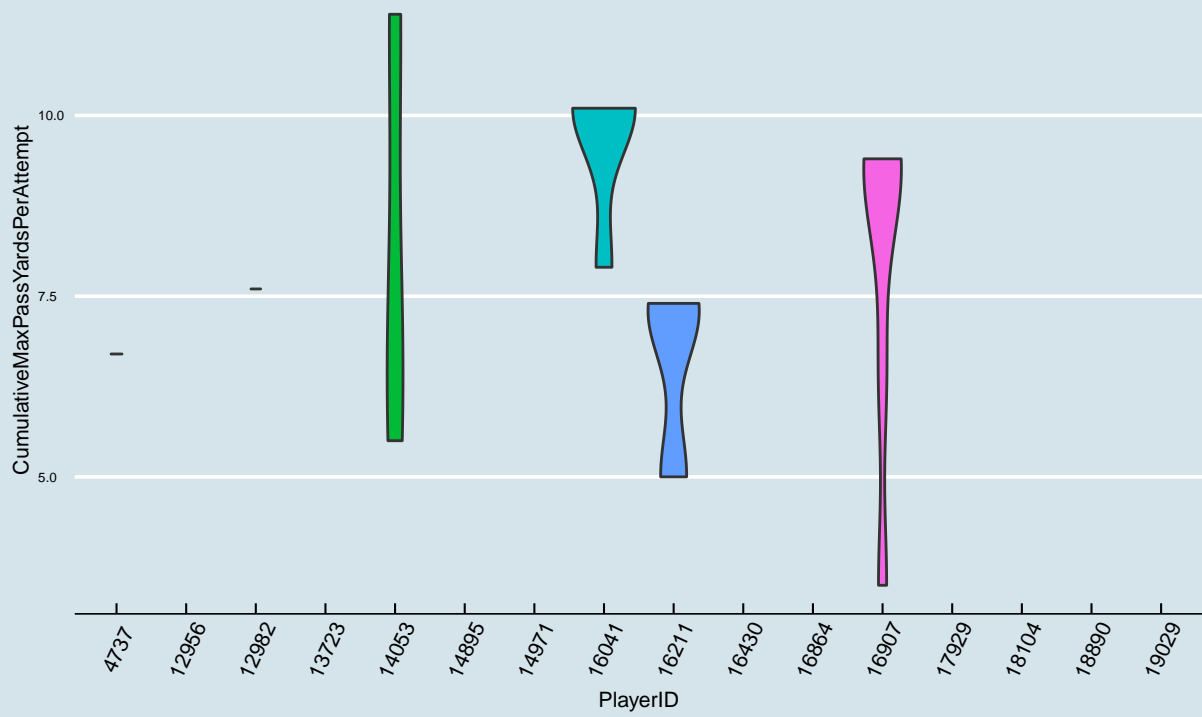
## Fantasyfootball

CumulativeMaxPassYardsPerAttempt



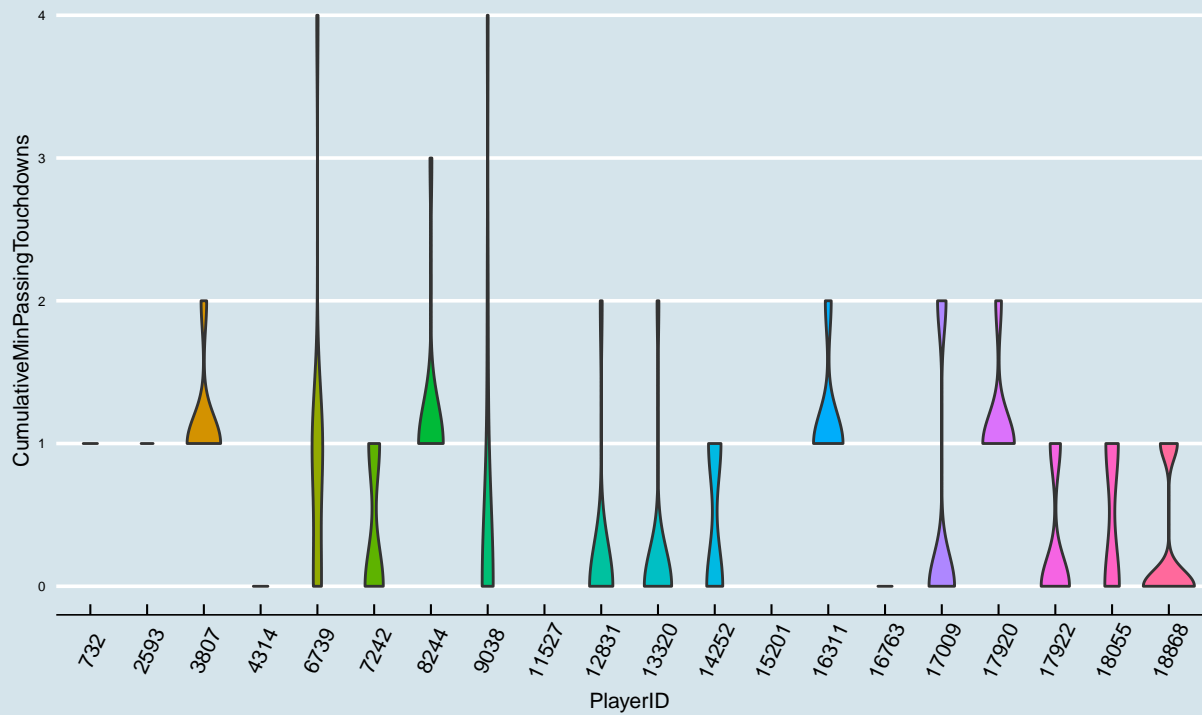
## Fantasyfootball

CumulativeMaxPassYardsPerAttempt



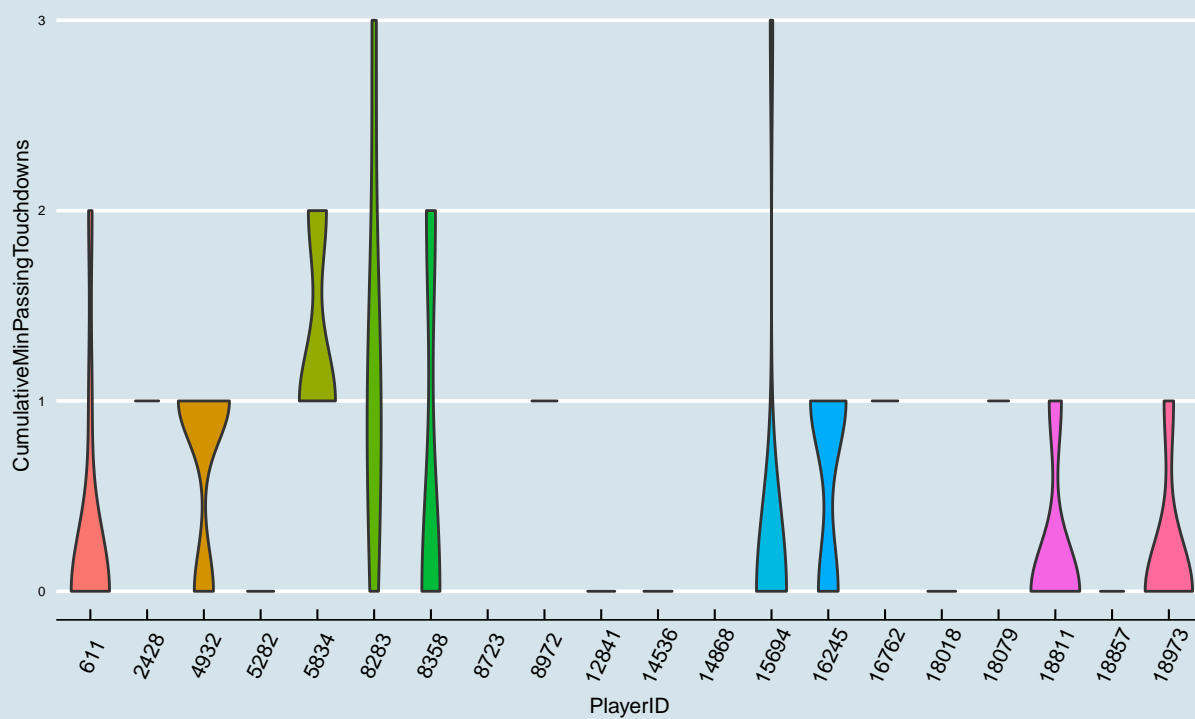
## Fantasyfootball

CumulativeMinPassingTouchdowns



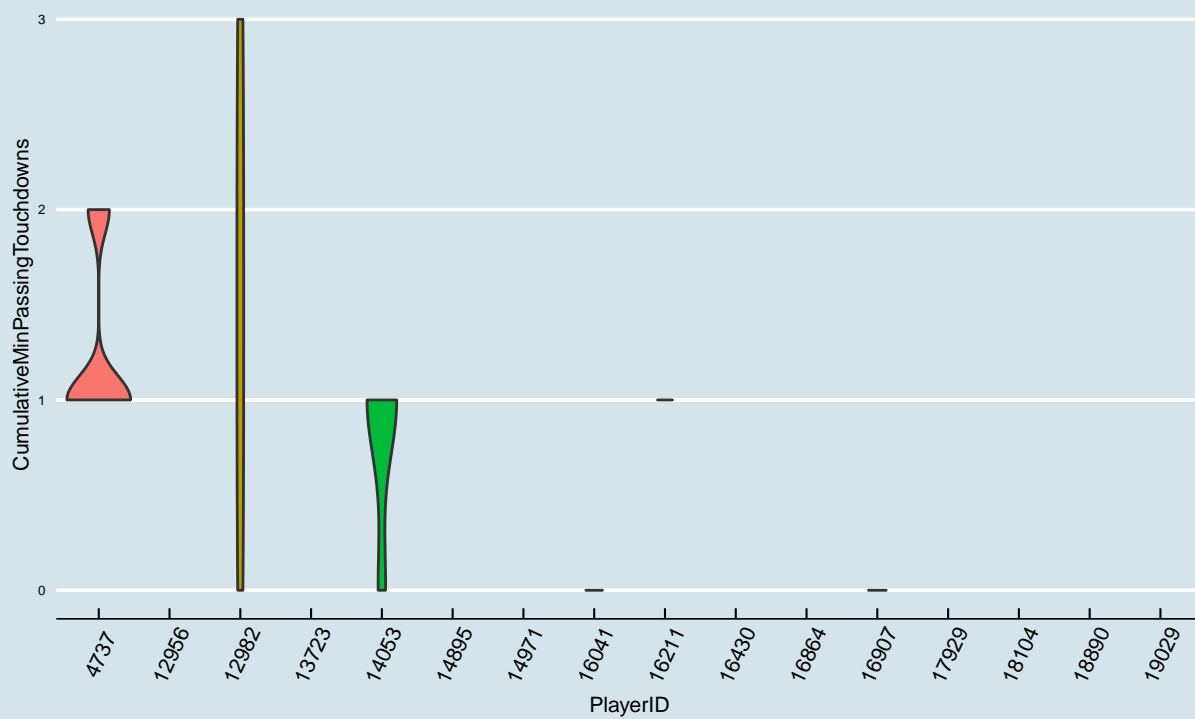
## Fantasyfootball

CumulativeMinPassingTouchdowns



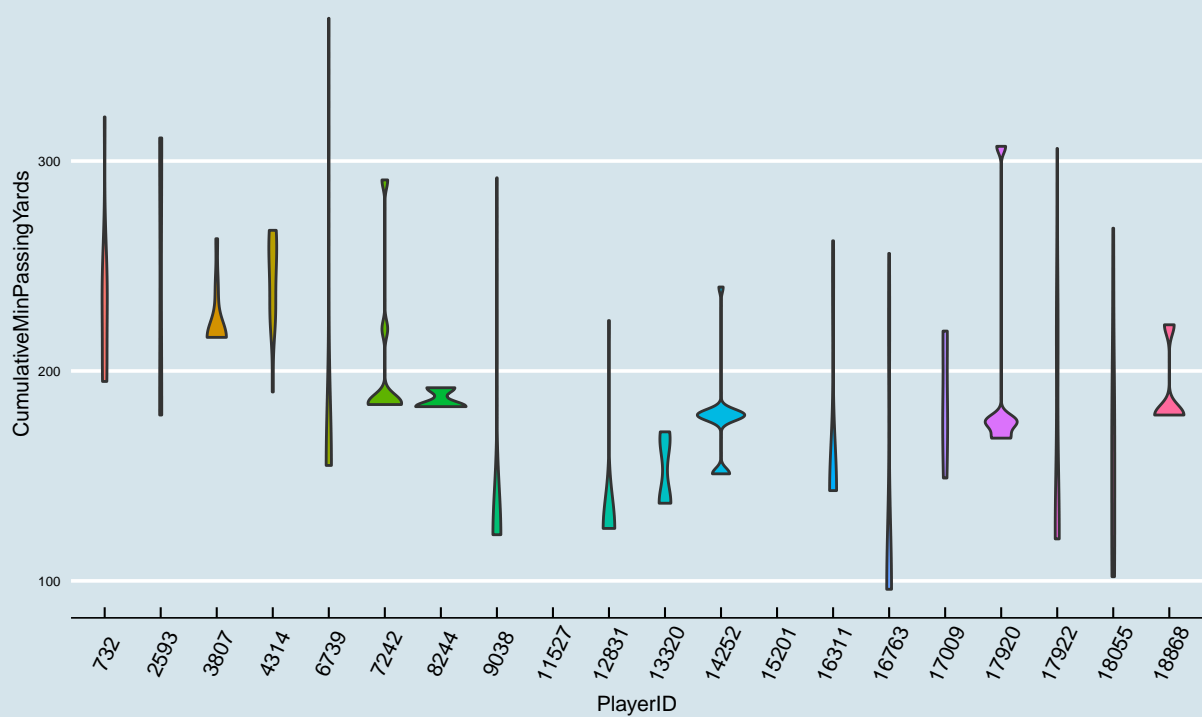
## Fantasyfootball

CumulativeMinPassingTouchdowns



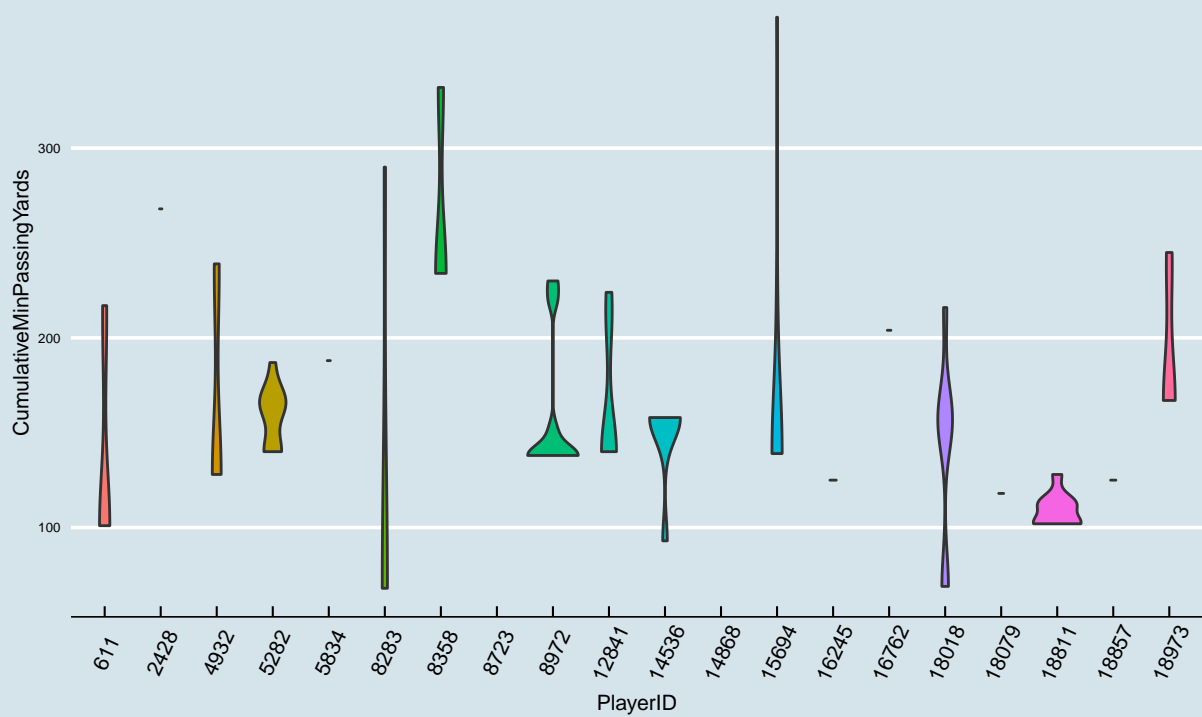
## Fantasyfootball

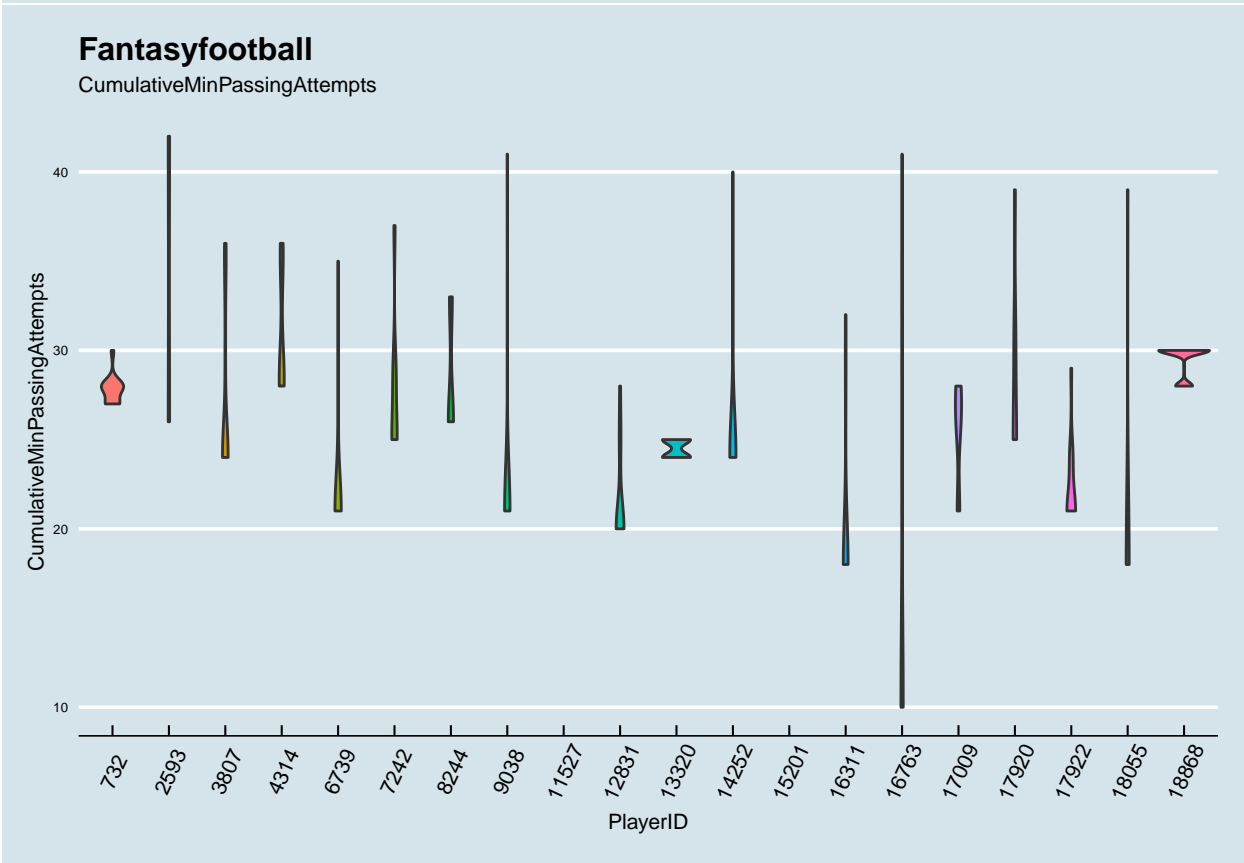
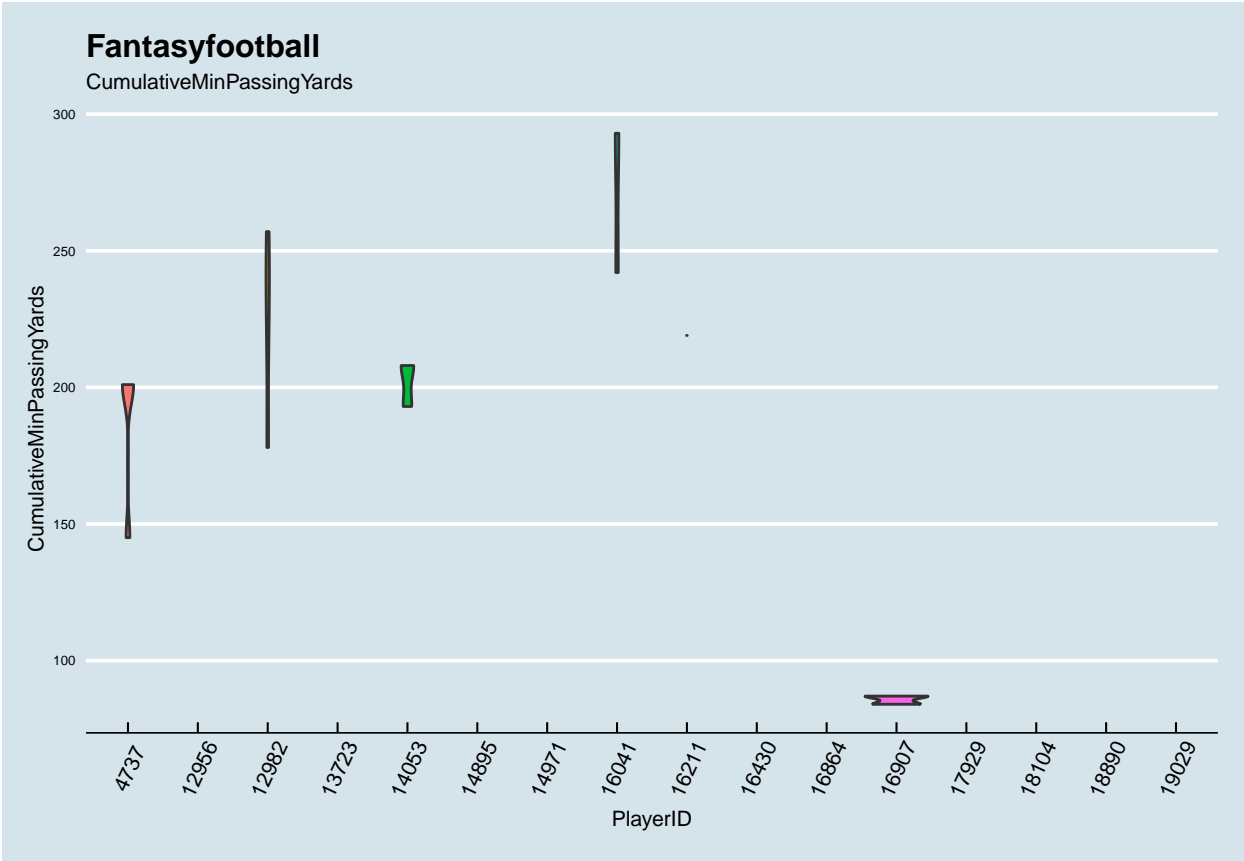
CumulativeMinPassingYards

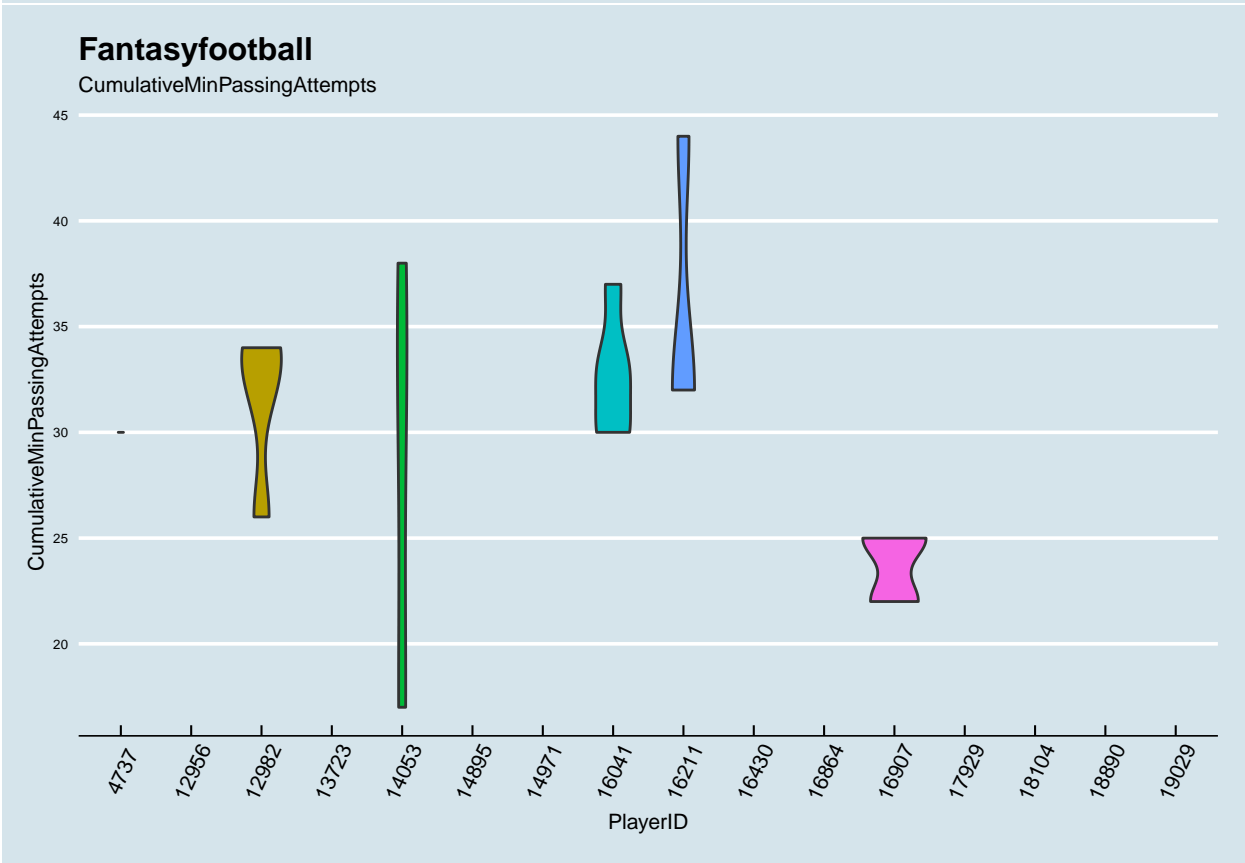
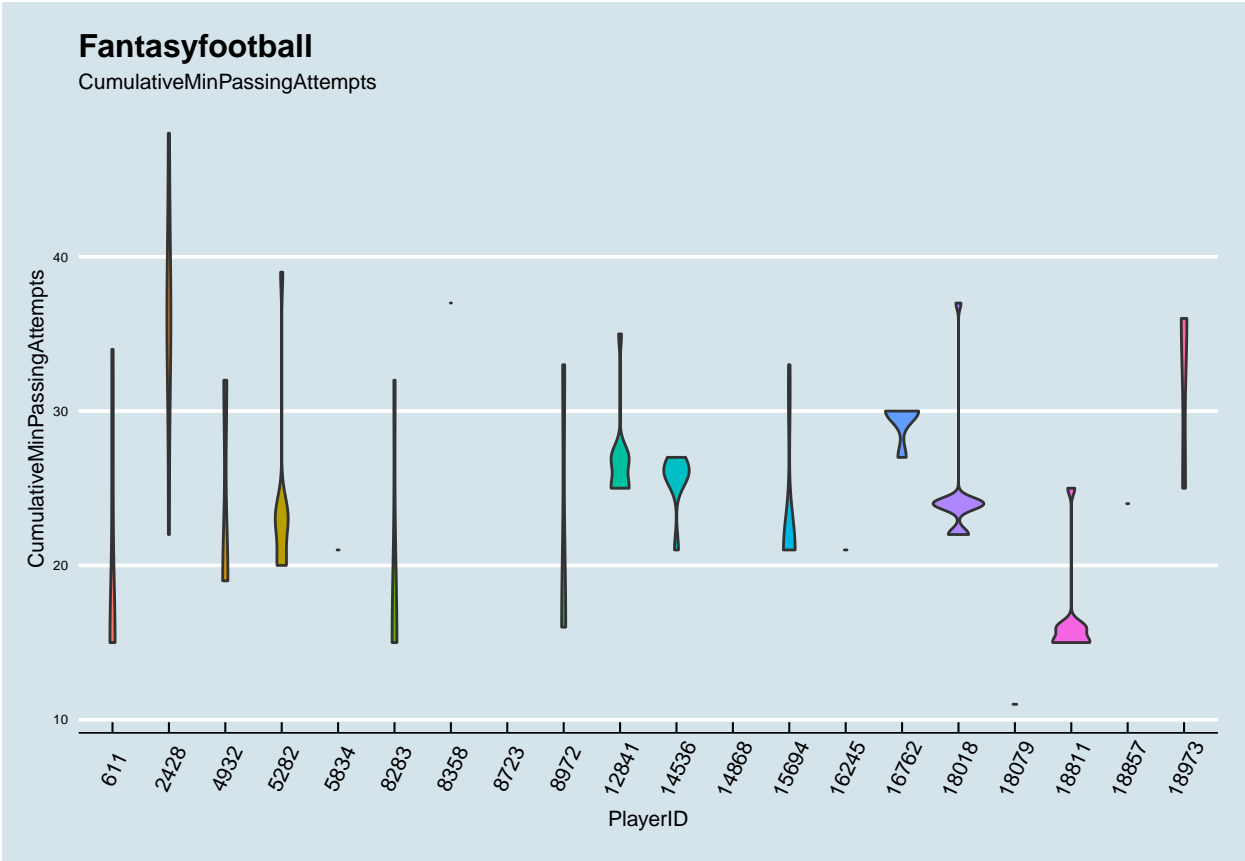


## Fantasyfootball

CumulativeMinPassingYards

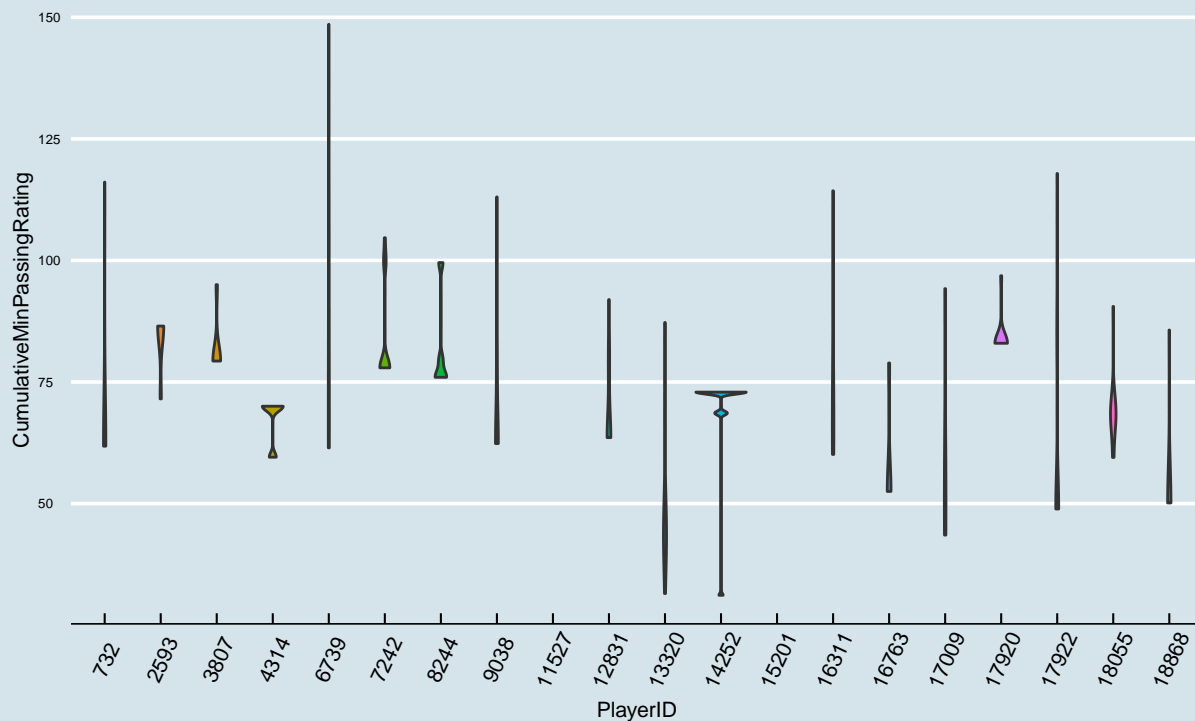






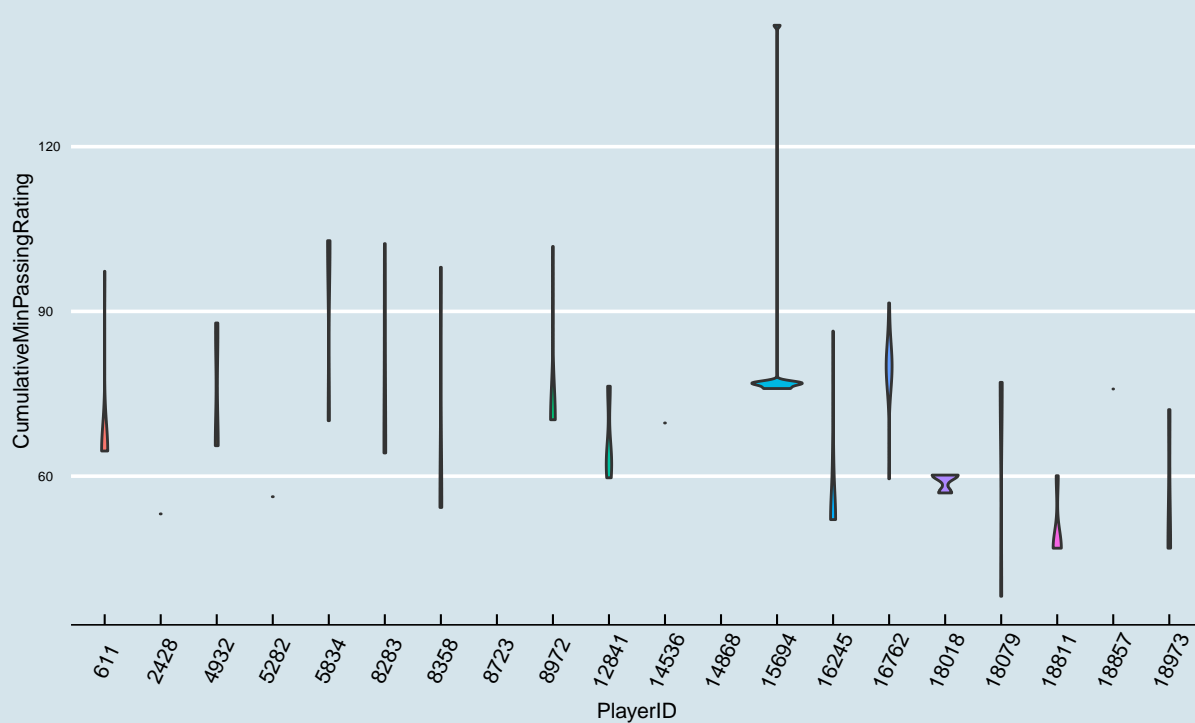
## Fantasyfootball

CumulativeMinPassingRating

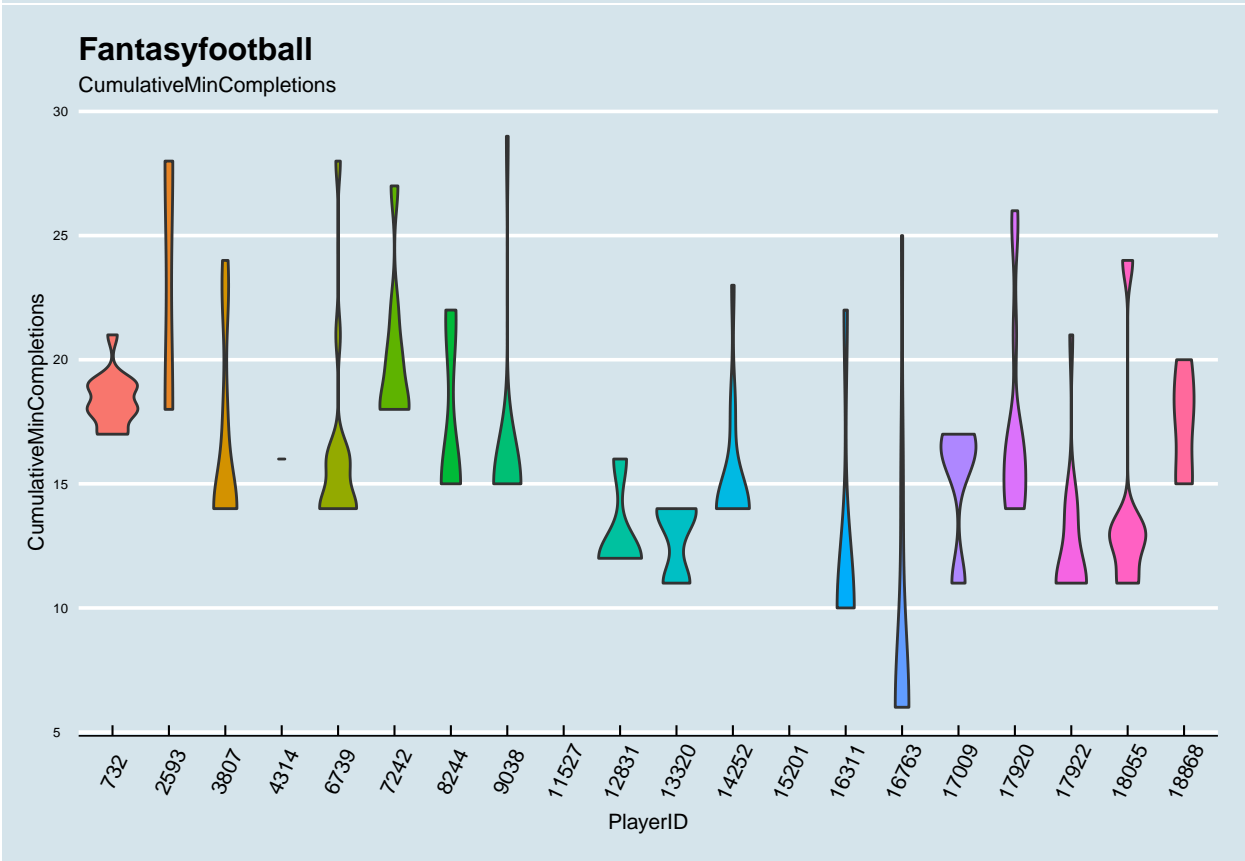
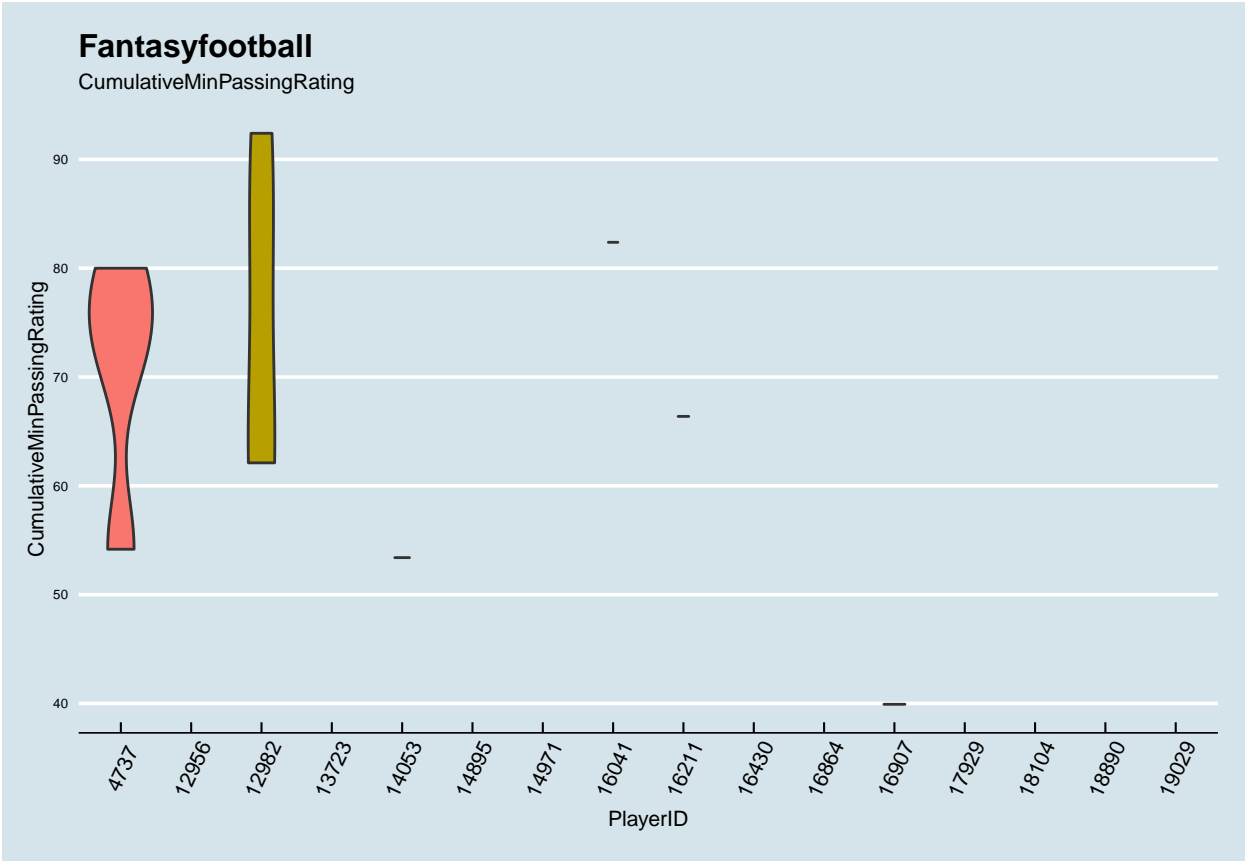


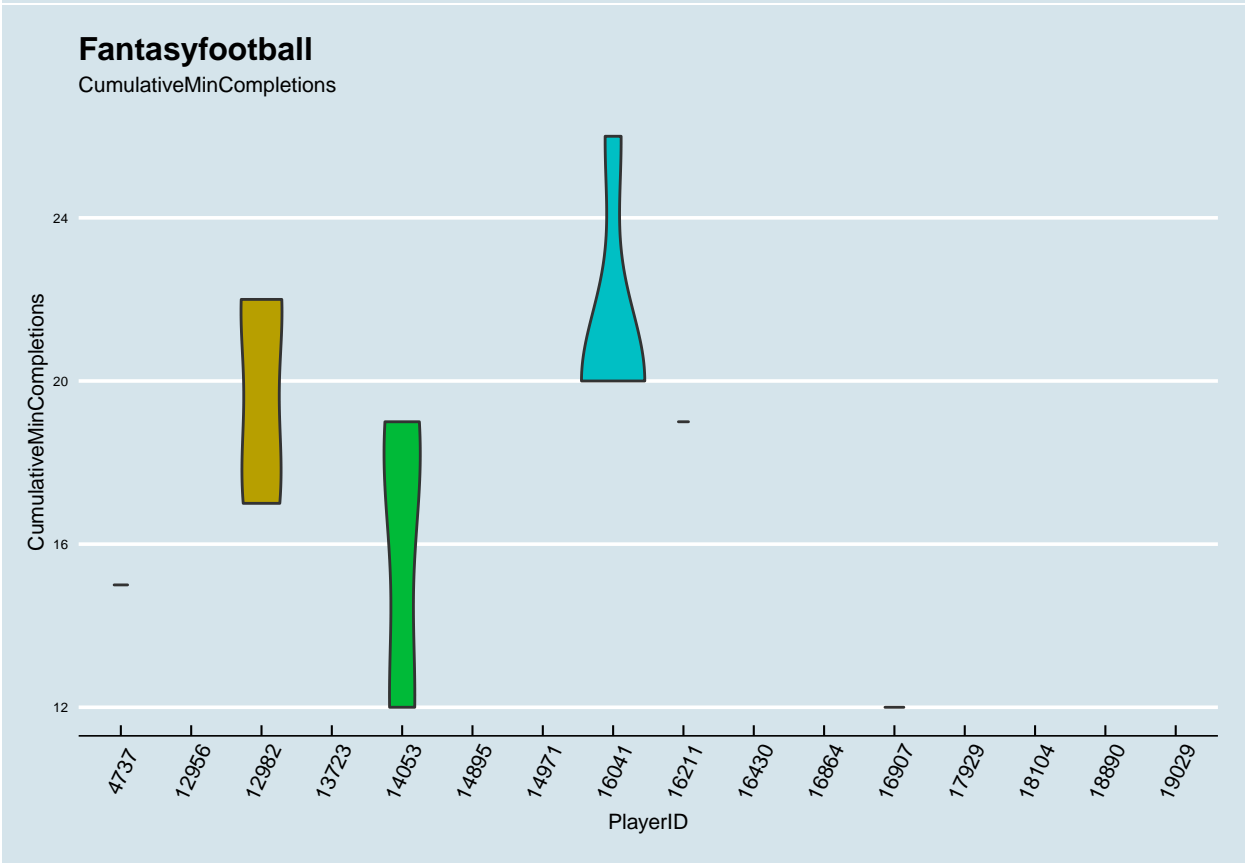
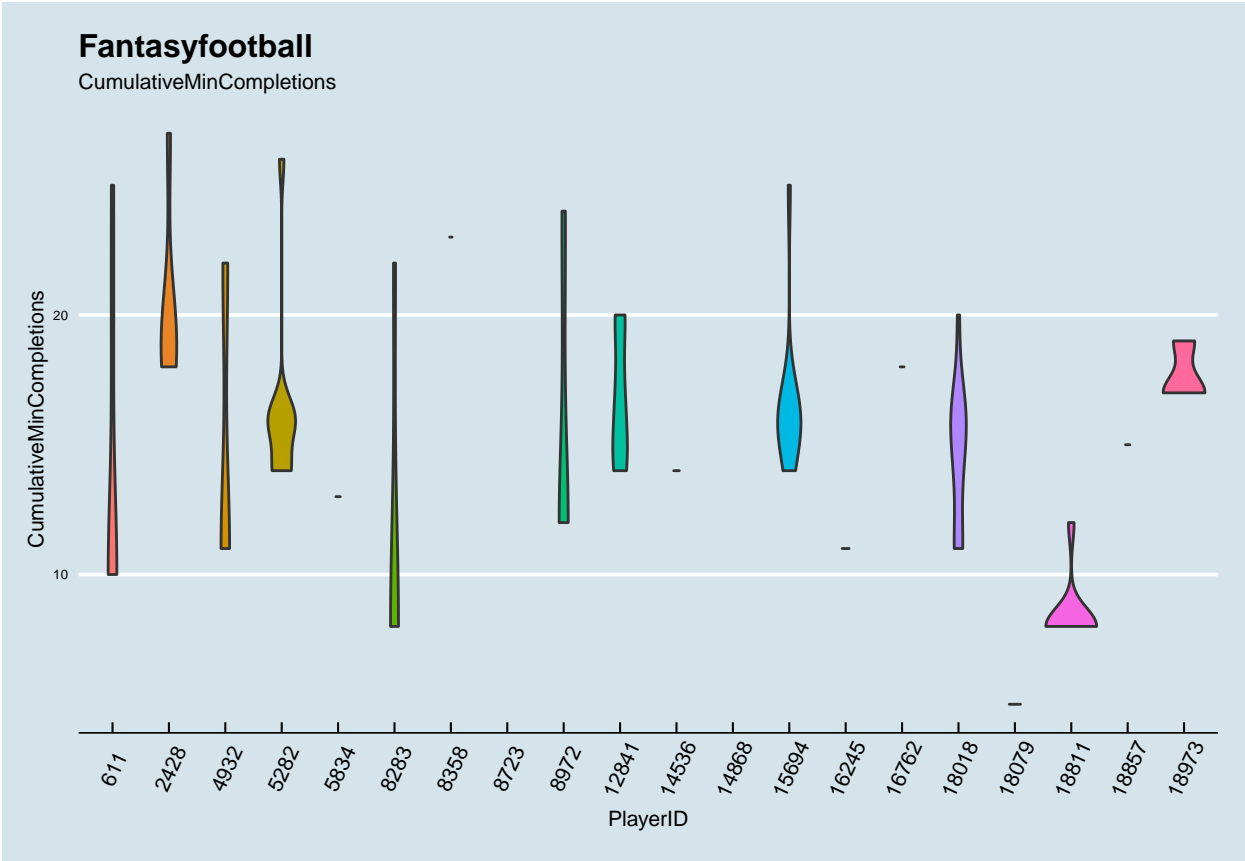
## Fantasyfootball

CumulativeMinPassingRating



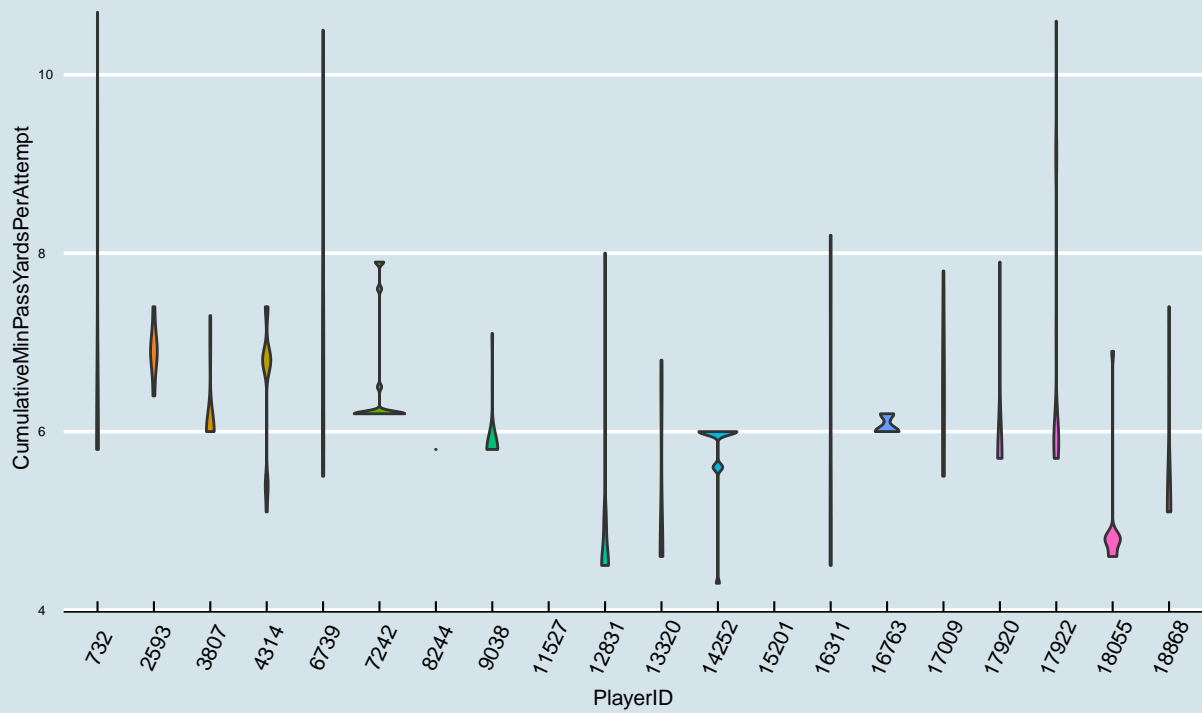






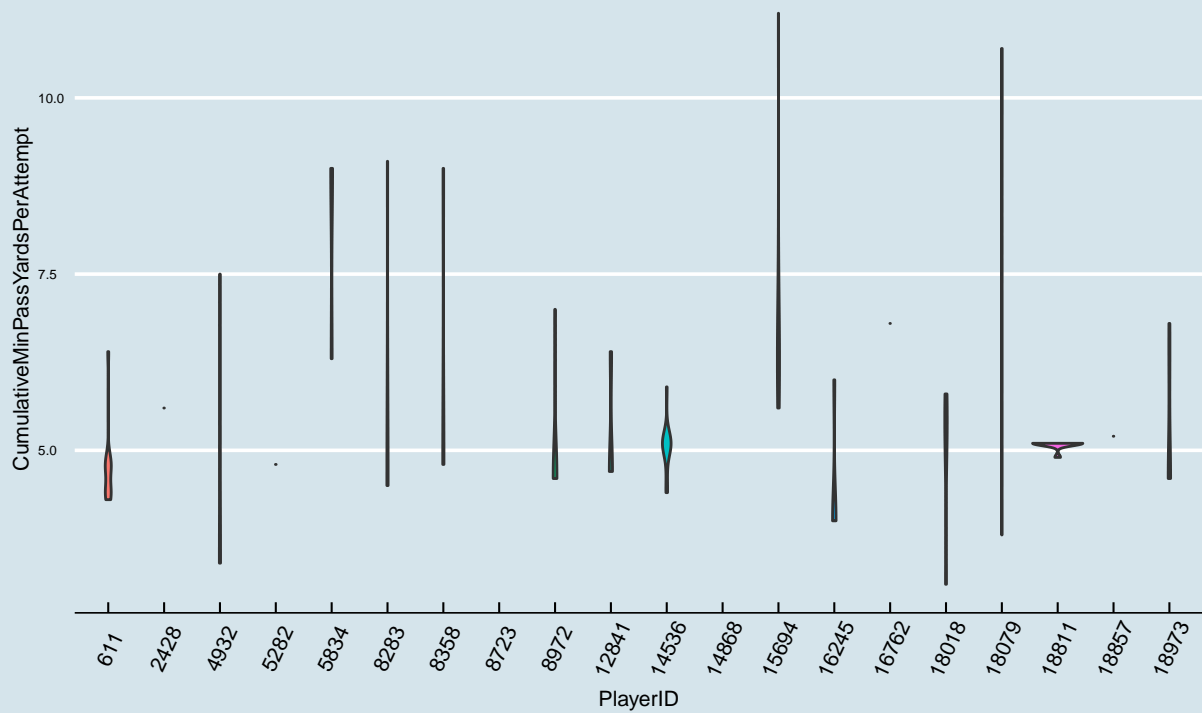
## Fantasyfootball

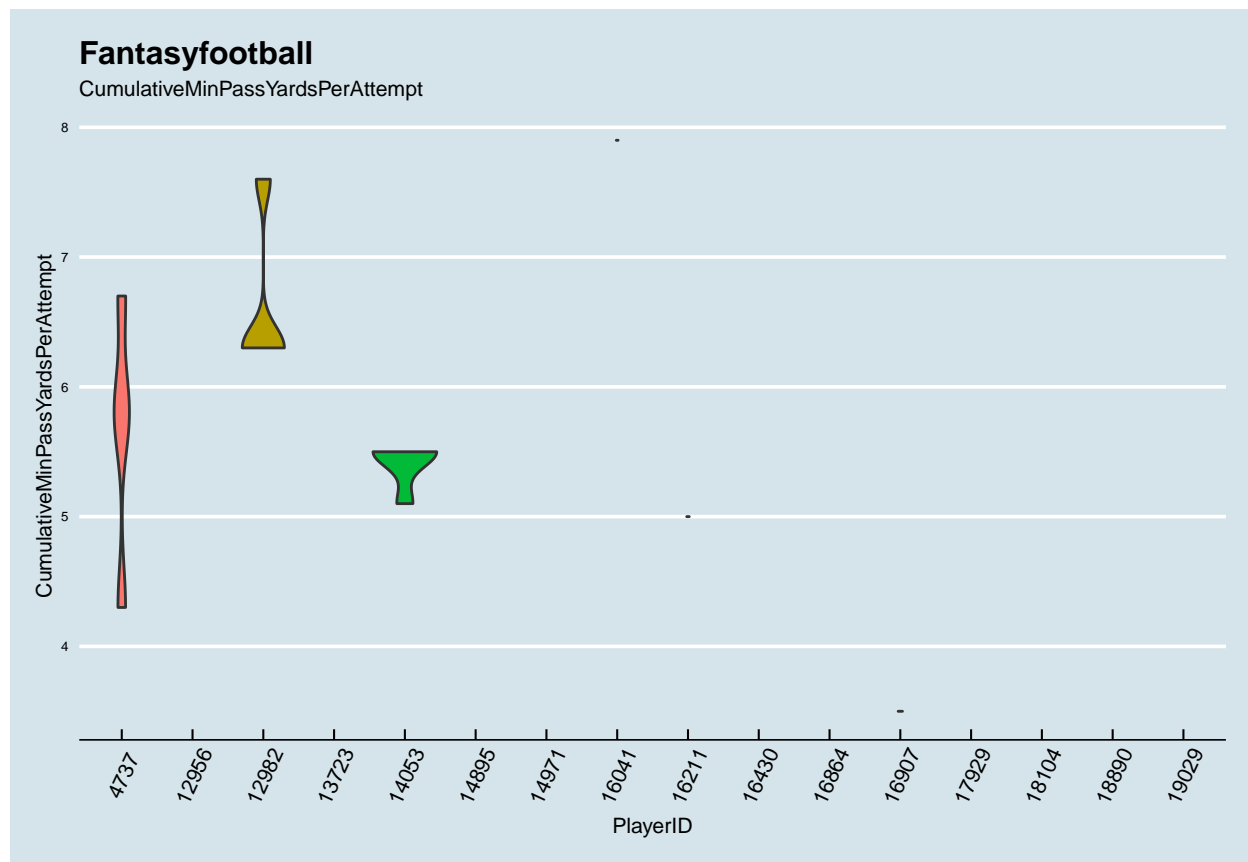
CumulativeMinPassYardsPerAttempt



## Fantasyfootball

CumulativeMinPassYardsPerAttempt





```
str(final_ds)
```

```
## Classes 'grouped_df', 'tbl_df', 'tbl' and 'data.frame':  453 obs. of  55 variables:
##  $ PlayerID          : num  6739 9038 11527 17009 17920 ...
##  $ Week              : Factor w/ 17 levels "1","2","3","4",...: 1 1 1 1 1 1 1 1 1 1 .
##  $ Position          : chr   "QB" "QB" "QB" "QB" ...
##  $ Opponent          : chr   "NE" "ARI" "NO" "LAC" ...
##  $ TeamIsHome        : logi   FALSE TRUE TRUE TRUE FALSE TRUE ...
##  $ GameDate          : Date, format: "2017-09-07" "2017-09-10" ...
##  $ PassingCompletions : num   28 29 27 17 26 25 16 22 20 21 ...
##  $ PassingAttempts    : num   35 41 32 28 39 41 28 32 30 30 ...
##  $ PassingCompletionPercentage : num   80 70.7 84.4 60.7 66.7 61 57.1 68.8 66.7 70 ...
##  $ PassingYards       : num   368 292 346 219 307 256 224 262 222 321 ...
##  $ PassingYardsPerAttempt : num   10.5 7.1 10.8 7.8 7.9 6.2 8 8.2 7.4 10.7 ...
##  $ PassingTouchdowns   : num    4 4 3 2 2 0 2 2 1 1 ...
##  $ PassingInterceptions : num    0 1 0 1 1 0 1 0 1 0 ...
##  $ PassingRating       : num  148.6 113.1 143 94.2 96.8 ...
##  $ RushingAttempts     : num    5 2 2 6 4 3 8 2 5 3 ...
##  $ RushingYards        : num    3 14 -3 19 6 26 38 2 17 11 ...
##  $ RushingYardsPerAttempt : num    0.6 7 -1.5 3.2 1.5 8.7 4.8 1 3.4 3.7 ...
##  $ RushingTouchdowns   : num    0 0 0 1 0 1 0 0 1 0 ...
##  $ FumblesLost         : num    0 0 0 0 1 0 0 0 0 0 ...
##  $ FantasyPoints        : num   31 27.1 25.5 22.7 18.9 ...
##  $ Team               : chr   "KC" "DET" "MIN" "DEN" ...
##  $ TacklesForLoss       : num    4 6 6 5 5 4 7 3 10 4 ...
##  $ Sacks               : num    3 1 1 4 2 1 2 2 7 2 ...
```

```

## $ QuarterbackHits : num 4 4 2 9 9 4 6 3 8 5 ...
## $ Interceptions : num 0 1 0 1 1 0 1 0 1 0 ...
## $ FumblesRecovered : num 1 0 0 1 1 0 0 0 0 0 ...
## $ Safeties : num 0 0 0 0 0 0 0 0 0 0 ...
## $ DefensiveTouchdowns : num 0 1 0 0 1 0 0 0 0 0 ...
## $ SoloTackles : num 50 54 50 45 43 39 56 41 45 38 ...
## $ AssistedTackles : num 13 12 20 22 18 16 26 18 21 12 ...
## $ SackYards : num 16 7 5 38 9 1 6 12 42 13 ...
## $ PassesDefended : num 3 6 2 5 8 5 5 3 3 4 ...
## $ FumblesForced : num 1 0 1 1 0 0 0 0 0 0 ...
## $ DefensiveFantasyPoints : num 1 8 0 8 12 2 4 2 16 2 ...
## $ PointsAllowedByDefenseSpecialTeams: num 42 29 29 24 24 16 21 26 18 23 ...
## $ WeeklyRank : int 2 8 1 8 10 3 5 3 12 3 ...
## $ CumulativeAveragePassingYards : num 368 292 346 219 307 256 224 262 222 321 ...
## $ CumulativeAveragePassingTouchdowns: num 4 4 3 2 2 0 2 2 1 1 ...
## $ CumulativeAverageCompletions : num 28 29 27 17 26 25 16 22 20 21 ...
## $ CumulativeMaxPassingTouchdowns : num 4 4 3 2 2 0 2 2 1 1 ...
## $ CumulativeMaxPassingYards : num 368 292 346 219 307 256 224 262 222 321 ...
## $ CumulativeMaxPassingAttempts : num 35 41 32 28 39 41 28 32 30 30 ...
## $ CumulativeMaxPassingRating : num 148.6 113.1 143 94.2 96.8 ...
## $ CumulativeMaxCompletions : num 28 29 27 17 26 25 16 22 20 21 ...
## $ CumulativeMaxPassYardsPerAttempt : num 10.5 7.1 10.8 7.8 7.9 6.2 8 8.2 7.4 10.7 ...
## $ CumulativeMinPassingTouchdowns : num 4 4 3 2 2 0 2 2 1 1 ...
## $ CumulativeMinPassingYards : num 368 292 346 219 307 256 224 262 222 321 ...
## $ CumulativeMinPassingAttempts : num 35 41 32 28 39 41 28 32 30 30 ...
## $ CumulativeMinPassingRating : num 148.6 113.1 143 94.2 96.8 ...
## $ CumulativeMinCompletions : num 28 29 27 17 26 25 16 22 20 21 ...
## $ CumulativeMinPassYardsPerAttempt : num 10.5 7.1 10.8 7.8 7.9 6.2 8 8.2 7.4 10.7 ...
## $ LastWeekQuarterBackRating : num NA NA NA NA NA NA NA NA NA NA ...
## $ LastWeekQuarterPassingYards : num NA NA NA NA NA NA NA NA NA NA ...
## $ LastWeekQuarterPassingTouchdowns : num NA NA NA NA NA NA NA NA NA NA ...
## $ NextWeekFantasyPoints : num 16.1 13.2 NA 22.6 24.8 ...
## - attr(*, "groups")=Classes 'tbl_df', 'tbl' and 'data.frame': 56 obs. of 2 variables:
## ..$ PlayerID: num 611 732 2428 2593 3807 ...
## ..$ .rows :List of 56
## .. ..$ : int 40 107 133 181 208 228 284 311 322 358 ...
## .. ..$ : int 10 39 77 109 154 173 197 221 254 276 ...
## .. ..$ : int 23 36 67 97 122 139
## .. ..$ : int 13 30 62 90 116 381
## .. ..$ : int 15 32 79 103 155 174 199 245 264 288 ...
## .. ..$ : int 19 25 55 93 127 143 172 193 242 266 ...
## .. ..$ : int 229 252 418 450
## .. ..$ : int 47 65 86 126 159 186 231 247 285 368 ...
## .. ..$ : int 22 37 76 124 142 166 190 225 259 291 ...
## .. ..$ : int 178 277 312
## .. ..$ : int 1 34 75 88 114 145 165 200 222 287 ...
## .. ..$ : int 16 28 68 95 156 170 203 220 257 267 ...
## .. ..$ : int 11 33 94 118 147 176 206 251 274 289 ...
## .. ..$ : int 140 233 261 269 310
## .. ..$ : int 61 110 117
## .. ..$ : int 135
## .. ..$ : int 42 80 153 180 215 255 334 349 412
## .. ..$ : int 2 41 72 104 123 146 191 217 243 272 ...
## .. ..$ : int 3

```

```

## .. .$ : int 7 49 71 100 132 169 195 212 273 307 ...
## .. .$ : int 52 73 85 125 183 189 253 271 299 321 ...
## .. .$ : int 355 400
## .. .$ : int 270 301 340 370
## .. .$ : int 17 46 81 84 115 141 185 201 218 236 ...
## .. .$ : int 377 424
## .. .$ : int 234 260 279 378 425
## .. .$ : int 20 45 60 92 136 167 205 235 237 265 ...
## .. .$ : int 24 38 56 87 130 164 187 216 244 263 ...
## .. .$ : int 128
## .. .$ : int 342
## .. .$ : int 449
## .. .$ : int 18 50
## .. .$ : int 57 108 129 152 192 240 275 290 327 353 ...
## .. .$ : int 339 360 384 404 436
## .. .$ : int 232 281 329
## .. .$ : int 21 51 59 101 150 175 226 248 286 294 ...
## .. .$ : int 8 29 105 162 202 230 282 304 330 366 ...
## .. .$ : int 432
## .. .$ : int 44 74 89 119 168 323 362 376 416 429
## .. .$ : int 6 43 70 98 148 184 227 246 278 314 ...
## .. .$ : int 399 448
## .. .$ : int 179 223 256 295 344 348 447
## .. .$ : int 4 27 82 102 144 209 305 364
## .. .$ : int 5 26 78 99 113 138 161 194 214 268 ...
## .. .$ : int 14 48 63 96 134 157 171 211 238 283 ...
## .. .$ : int 439
## .. .$ : int 53 58 106 120 149 182 196 219 250 315 ...
## .. .$ : int 12 35 64 91 112 163 210 213 258 332 ...
## .. .$ : int 54 121 160
## .. .$ : int 451
## .. .$ : int 131 158 207 249 280 341 351 397 405 453
## .. .$ : int 31 69 83 111 137 188
## .. .$ : int 9 66 198 241 297 335 356 428
## .. .$ : int 445
## .. .$ : int 151 177 204 224 239 313
## .. .$ : int 262 373
## ..- attr(*, ".drop")= logi TRUE

```

Do we want to convert any of these to factors?