Geometric mean for the scores

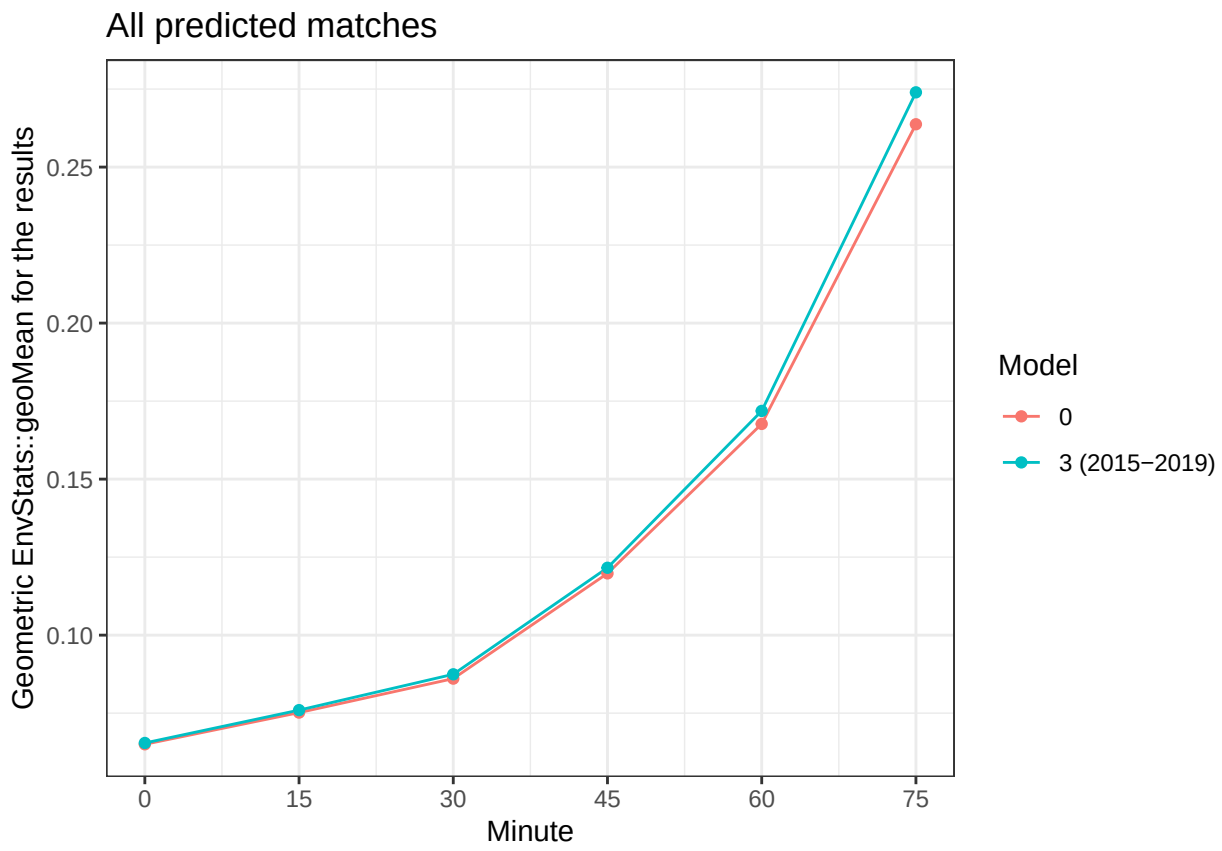
```
library(dplyr)
library(ggplot2)
library(tidyr)
library(knitr)

load("data/HDA2.RData")
load("~/GitHub/soccer-live-predictions/soccer-live-predictions/scrape/data/reds.RData")

nrow(HDA2)
```

```
## [1] 340
```

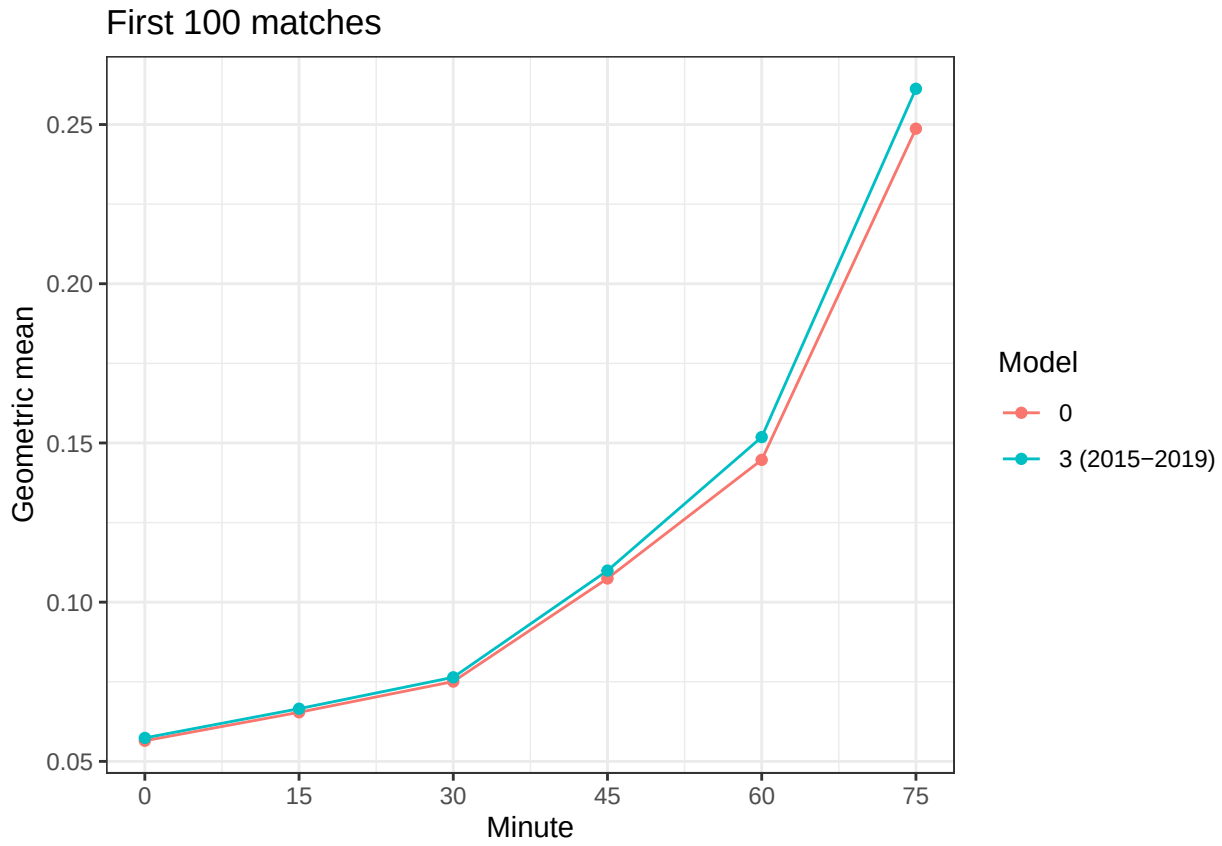
```
all = tibble(GeoMean = apply(HDA2[,c(93:104)], 2, EnvStats::geoMean),
             Minute = as.integer(rep(c(0, 15, 30, 45, 60, 75), 2)),
             Model = factor(c(rep("0", 6), rep("3 (2015-2019)", 6)),
                            levels = c("0", "3 (2015-2019)")))
all %>%
  ggplot(aes(x = Minute, y = GeoMean, col = Model)) +
  geom_line() +
  geom_point() +
  scale_x_continuous(breaks = c(0, 15, 30, 45, 60, 75)) +
  theme_bw() +
  ggtitle("All predicted matches") +
  ylab("Geometric EnvStats::geoMean for the results")
```




```
all %>%
  pivot_wider(id_cols = "Model", values_from = "GeoMean", names_from = "Minute",
              names_prefix = "Minute ") %>%
  kable()
```

Model	Minute 0	Minute 15	Minute 30	Minute 45	Minute 60	Minute 75
0	0.0650123	0.0751725	0.0860576	0.1197835	0.1676894	0.2637308
3 (2015-2019)	0.0654387	0.0759664	0.0874461	0.1215844	0.1718562	0.2739551

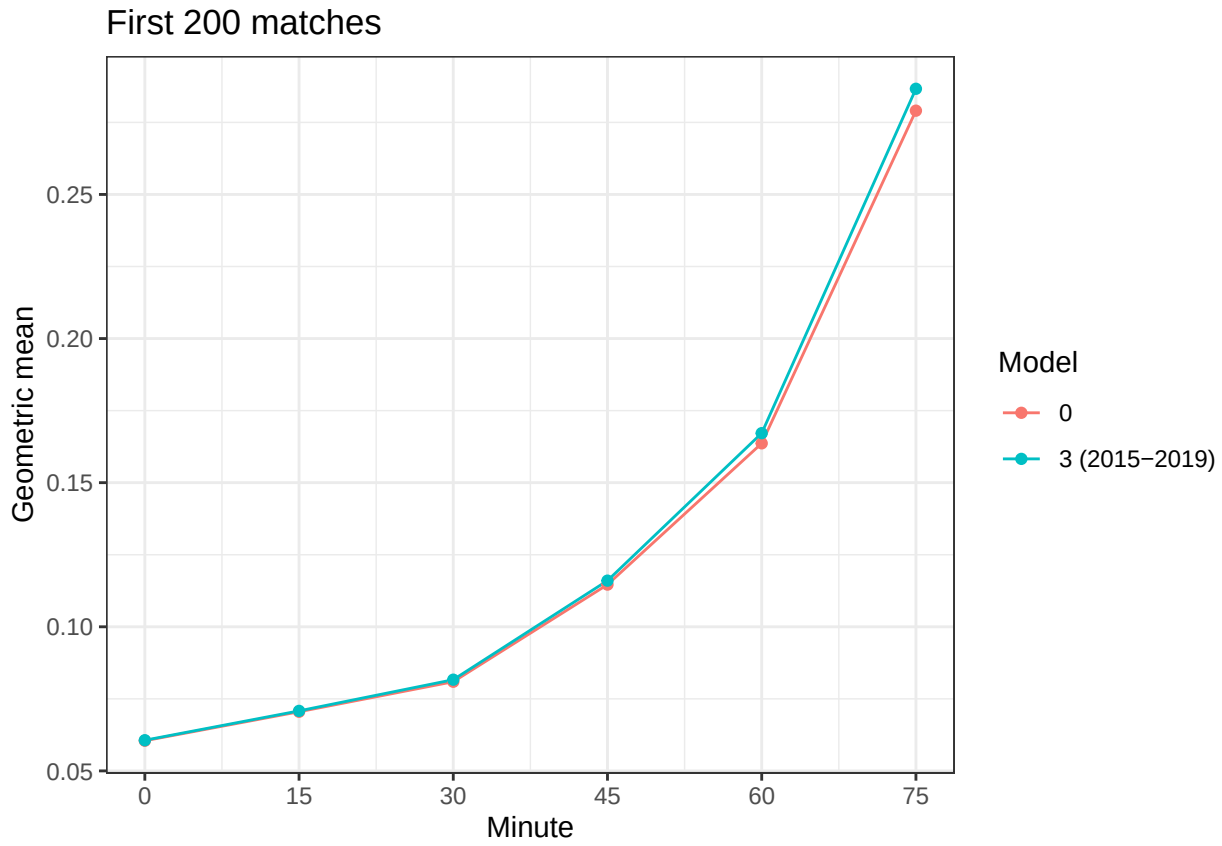
```
first_100 = tibble(GeoMean = apply(HDA2[c(1:100), c(93:104)], 2, EnvStats::geoMean),
                   Minute = as.integer(rep(c(0, 15, 30, 45, 60, 75), 2)),
                   Model = factor(c(rep("0", 6), rep("3 (2015-2019)", 6)),
                                  levels = c("0", "3 (2015-2019)")))
first_100 %>%
  ggplot(aes(x = Minute, y = GeoMean, col = Model)) +
  geom_line() +
  geom_point() +
  scale_x_continuous(breaks = c(0, 15, 30, 45, 60, 75)) +
  theme_bw() +
  ggtitle("First 100 matches") +
  ylab("Geometric mean")
```




```
first_100 %>%
  pivot_wider(id_cols = "Model", values_from = "GeoMean", names_from = "Minute",
              names_prefix = "Minute ") %>%
  kable()
```

Model	Minute 0	Minute 15	Minute 30	Minute 45	Minute 60	Minute 75
0	0.0564769	0.0654153	0.0750633	0.1074376	0.1446952	0.2486883
3 (2015-2019)	0.0573675	0.0665449	0.0764013	0.1099139	0.1518408	0.2612219

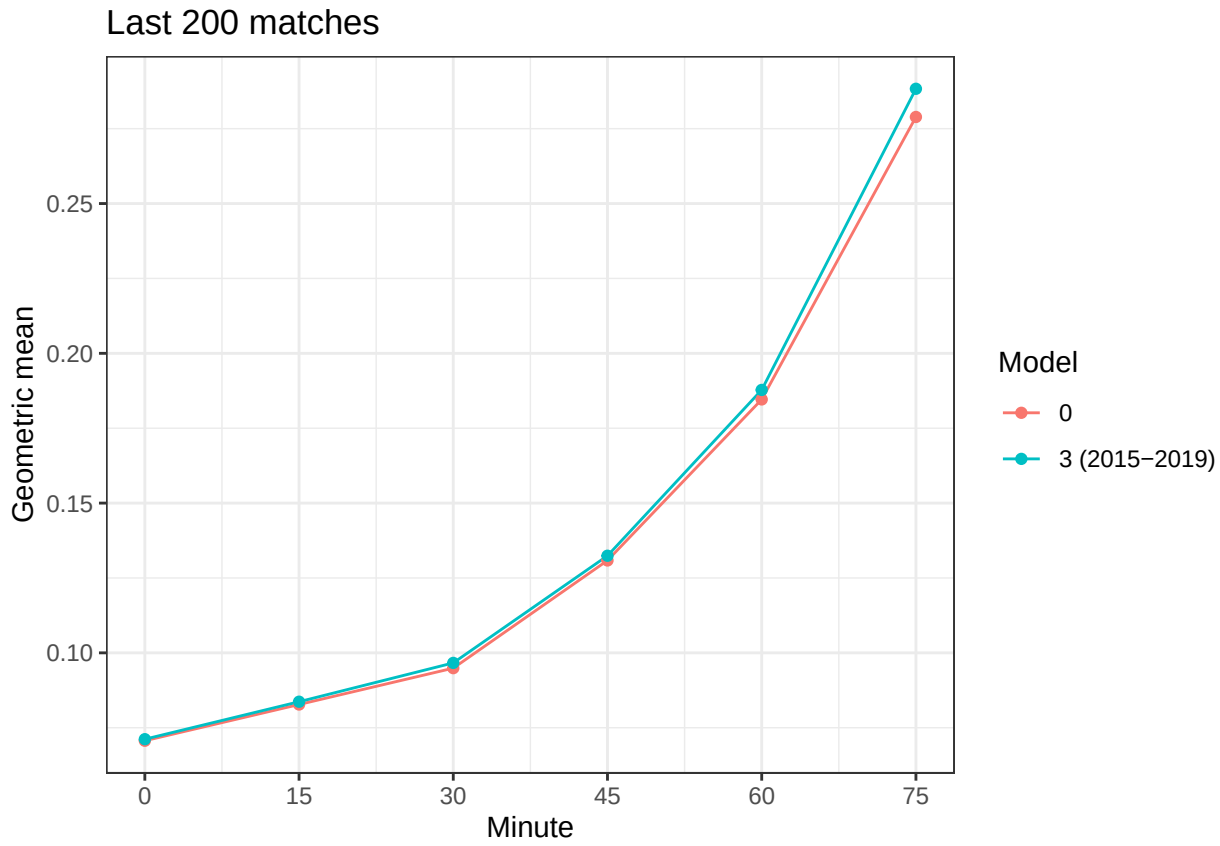
```
first_200 = tibble(GeoMean = apply(HDA2[c(1:200), c(93:104)], 2, EnvStats::geoMean),
                   Minute = as.integer(rep(c(0, 15, 30, 45, 60, 75), 2)),
                   Model = factor(c(rep("0", 6), rep("3 (2015-2019)", 6)),
                                  levels = c("0", "3 (2015-2019)")))
first_200 %>%
  ggplot(aes(x = Minute, y = GeoMean, col = Model)) +
  geom_line() +
  geom_point() +
  scale_x_continuous(breaks = c(0, 15, 30, 45, 60, 75)) +
  theme_bw() +
  ggtitle("First 200 matches") +
  ylab("Geometric mean")
```




```
first_200 %>%
  pivot_wider(id_cols = "Model", values_from = "GeoMean", names_from = "Minute",
              names_prefix = "Minute ") %>%
  kable()
```

Model	Minute 0	Minute 15	Minute 30	Minute 45	Minute 60	Minute 75
0	0.0604588	0.0705187	0.0809341	0.1146352	0.1636536	0.2790687
3 (2015-2019)	0.0606397	0.0708234	0.0816450	0.1160108	0.1671775	0.2866582

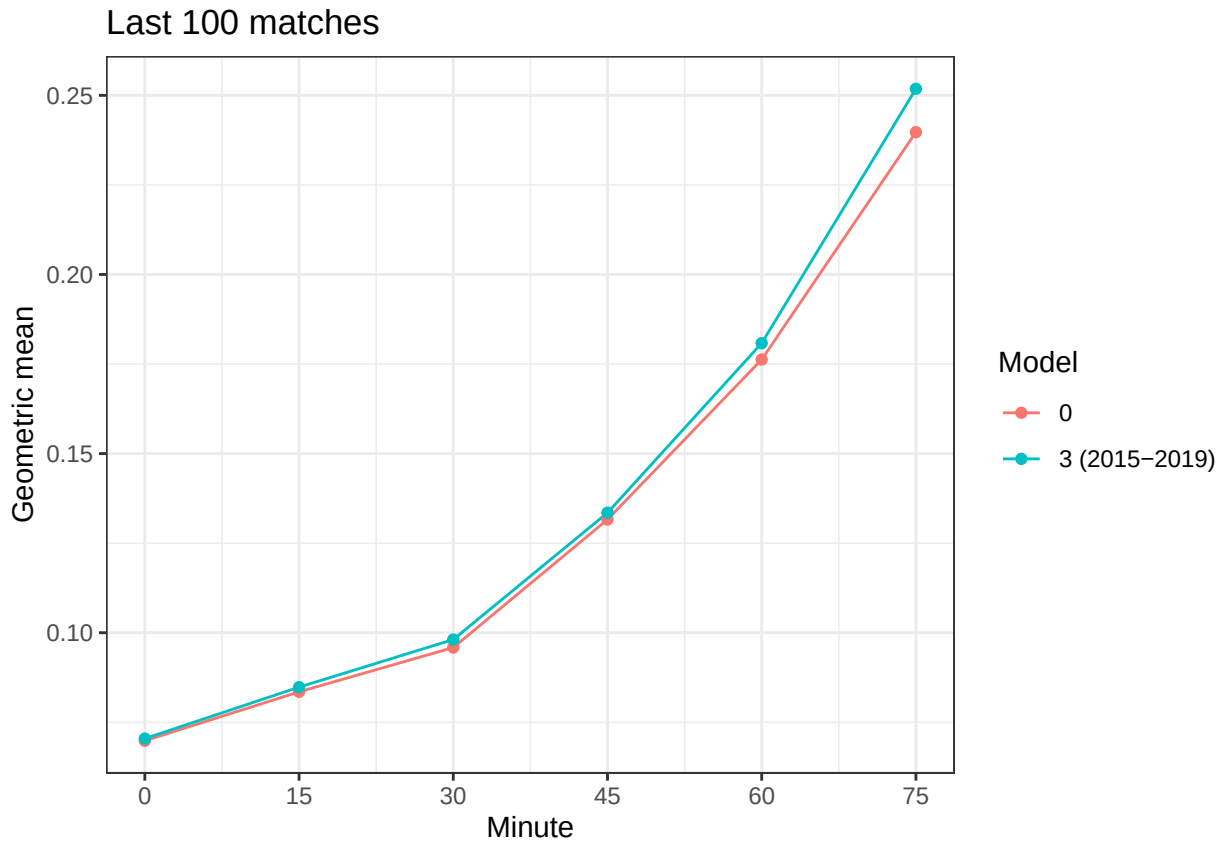
```
last_200 = tibble(GeoMean = apply(HDA2[c(141:340), c(93:104)], 2, EnvStats::geoMean),
                  Minute = as.integer(rep(c(0, 15, 30, 45, 60, 75), 2)),
                  Model = factor(c(rep("0", 6), rep("3 (2015-2019)", 6)),
                                 levels = c("0", "3 (2015-2019)")))
last_200 %>%
  ggplot(aes(x = Minute, y = GeoMean, col = Model)) +
  geom_line() +
  geom_point() +
  scale_x_continuous(breaks = c(0, 15, 30, 45, 60, 75)) +
  theme_bw() +
  ggtitle("Last 200 matches") +
  ylab("Geometric mean")
```




```
last_200 %>%
  pivot_wider(id_cols = "Model", values_from = "GeoMean", names_from = "Minute",
              names_prefix = "Minute ") %>%
  kable()
```

Model	Minute 0	Minute 15	Minute 30	Minute 45	Minute 60	Minute 75
0	0.0706540	0.0827560	0.0948948	0.1308454	0.1846071	0.2789055
3 (2015-2019)	0.0711776	0.0836872	0.0966452	0.1324168	0.1877794	0.2883134

```
last_100 = tibble(GeoMean = apply(HDA2[c(241:340), c(93:104)], 2, EnvStats::geoMean),
                  Minute = as.integer(rep(c(0, 15, 30, 45, 60, 75), 2)),
                  Model = factor(c(rep("0", 6), rep("3 (2015-2019)", 6)),
                                 levels = c("0", "3 (2015-2019)")))
last_100 %>%
  ggplot(aes(x = Minute, y = GeoMean, col = Model)) +
  geom_line() +
  geom_point() +
  scale_x_continuous(breaks = c(0, 15, 30, 45, 60, 75)) +
  theme_bw() +
  ggtitle("Last 100 matches") +
  ylab("Geometric mean")
```




```
last_100 %>%
  pivot_wider(id_cols = "Model", values_from = "GeoMean", names_from = "Minute",
              names_prefix = "Minute ") %>%
  kable()
```

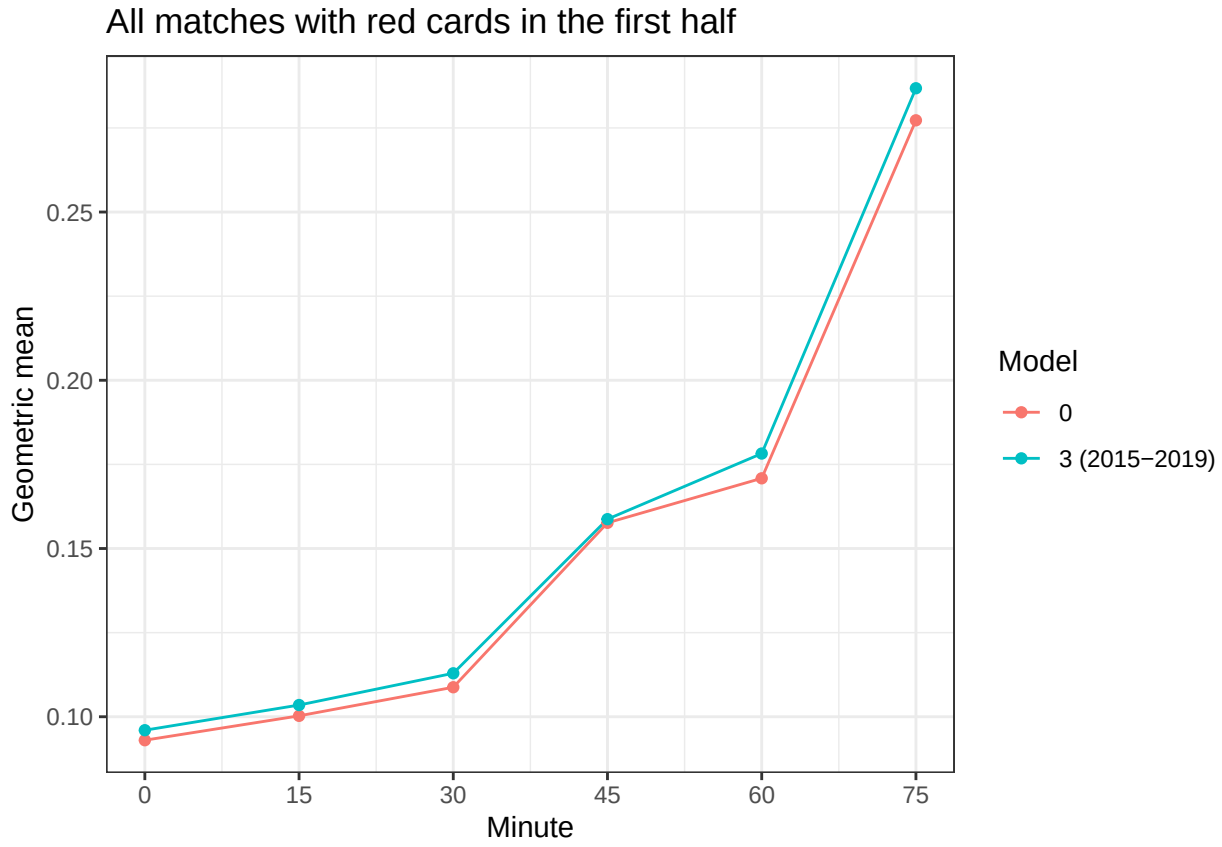
Model	Minute 0	Minute 15	Minute 30	Minute 45	Minute 60	Minute 75
0	0.0698463	0.0835012	0.0958624	0.1315967	0.1762666	0.2397213
3 (2015-2019)	0.0704536	0.0848112	0.0981016	0.1334861	0.1808238	0.2518300

```
matches = reds %>%
  filter(Season == 2020, Half == 1) %>%
  .$Match
length(matches)
```

```
## [1] 23
```

```
HDA2_reds = HDA2 %>%
  filter(Match %in% matches)

all_reds = tibble(GeoMean = apply(HDA2_reds[,c(93:104)], 2, EnvStats::geoMean),
                  Minute = as.integer(rep(c(0, 15, 30, 45, 60, 75), 2)),
                  Model = factor(c(rep("0", 6), rep("3 (2015-2019)", 6)),
                                 levels = c("0", "3 (2015-2019)")))
all_reds %>%
  ggplot(aes(x = Minute, y = GeoMean, col = Model)) +
  geom_line() +
  geom_point() +
  scale_x_continuous(breaks = c(0, 15, 30, 45, 60, 75)) +
  theme_bw() +
  ggtitle("All matches with red cards in the first half") +
  ylab("Geometric mean")
```



```
all_reds %>%
  pivot_wider(id_cols = "Model", values_from = "GeoMean", names_from = "Minute",
              names_prefix = "Minute ") %>%
  kable()
```

Model	Minute 0	Minute 15	Minute 30	Minute 45	Minute 60	Minute 75
0	0.0930256	0.1002720	0.1087691	0.1576361	0.1708698	0.2772594
3 (2015-2019)	0.0960047	0.1034844	0.1129214	0.1587273	0.1782260	0.2867857