Ebola Forecasting - Important Figures

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1 Dataset Selection

```
hr3 <- c("2018-08-26","2019-07-26","2020-02-06") #selection of datasets
```

```
indh <- indr <- c(2,149,161) #corresponding indices for above dates, done manually
print(hpreds3 <- hpreds[,indh])
```

```
##          2 164 176
## pred.7   7  54   5
## pred.14 13 108  10
## pred.21 18 157  15
```

```
print(rpreds3 <- rpreds[,indr])
```

```
##            2   164  176
## pred.7   4.0  44.2  5.0
## pred.14  7.6  89.0 11.7
## pred.21 10.7 127.7 19.6
```

2 Full Outbreak

```
title <- paste0("Cumulative Ebola Cases by Day in West Africa")
p <- ggplot(
  data = true,
  mapping = aes(x = date, y = total)) +
  geom_line() + theme_light() + labs(caption = title) +
  theme(plot.caption = element_text(hjust = 0.5)) +
  scale_x_date(date_breaks = "5 months", date_labels = "%b-%y")
p #+ theme(panel.grid.minor = element_blank())
```

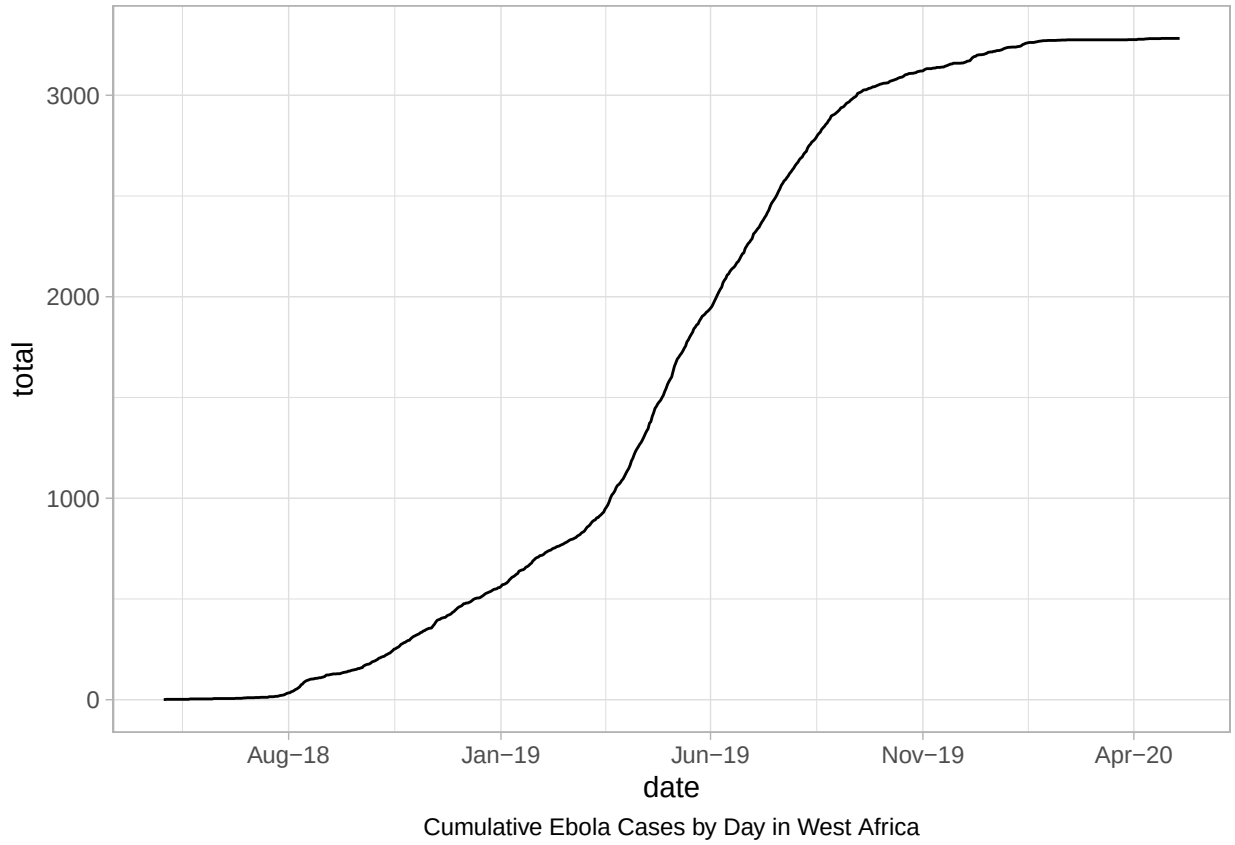


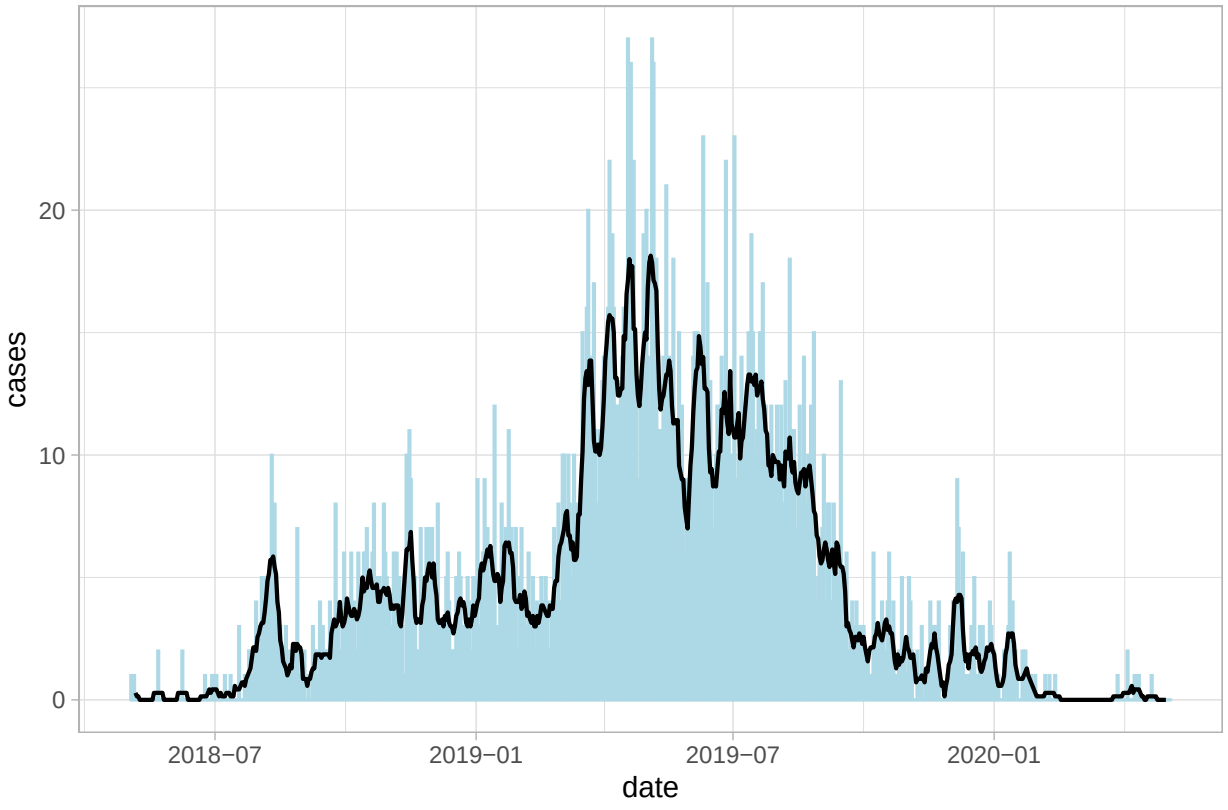
Figure 1: Cumulative Ebola Cases by Day in West Africa

```
#ggsave("test.png",p,width = 6, height = 4, units="in")
```

3 New Cases by Day

```
true <- true %>% mutate(seven_day_avg = zoo::rollmean(cases, k = 7,fill = NA))
# add rolling average
```

```
title <- paste0("Ebola Cases by Day in West Africa with 7-day Rolling Average")
ggplot(
  data = true,
  mapping = aes(x = date, y = cases)
) + geom_col(color = "lightblue") + theme_light() +
  geom_path(
    data = true,
    mapping = aes(x = date, y = seven_day_avg),
    color = "black",
    size = 0.75
  ) + labs(caption = title) +
  theme(plot.caption = element_text(hjust = 0.5))
```



Ebola Cases by Day in West Africa with 7−day Rolling Average

```
  scale_x_date(date_breaks = "5 months", date_labels = "%b-%y")
```

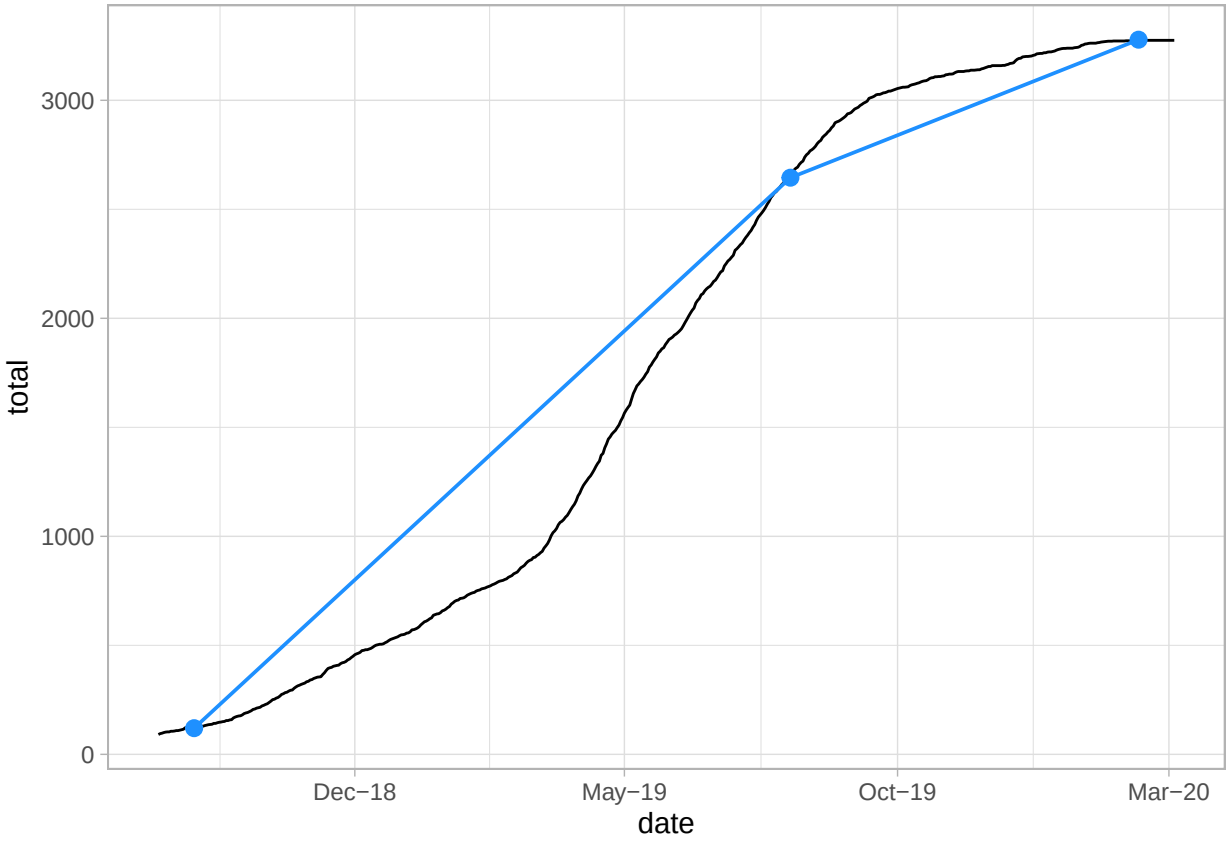
```
## <ScaleContinuousDate>
##  Range:
##  Limits:    0 --    1
```

4 Hawkes Forecasts

4.1 Hawkes 7-Day

```
print(h7 <- single_forecast(hr3, hpreds3, days = 7, point = T))
```

```
## $plot
```

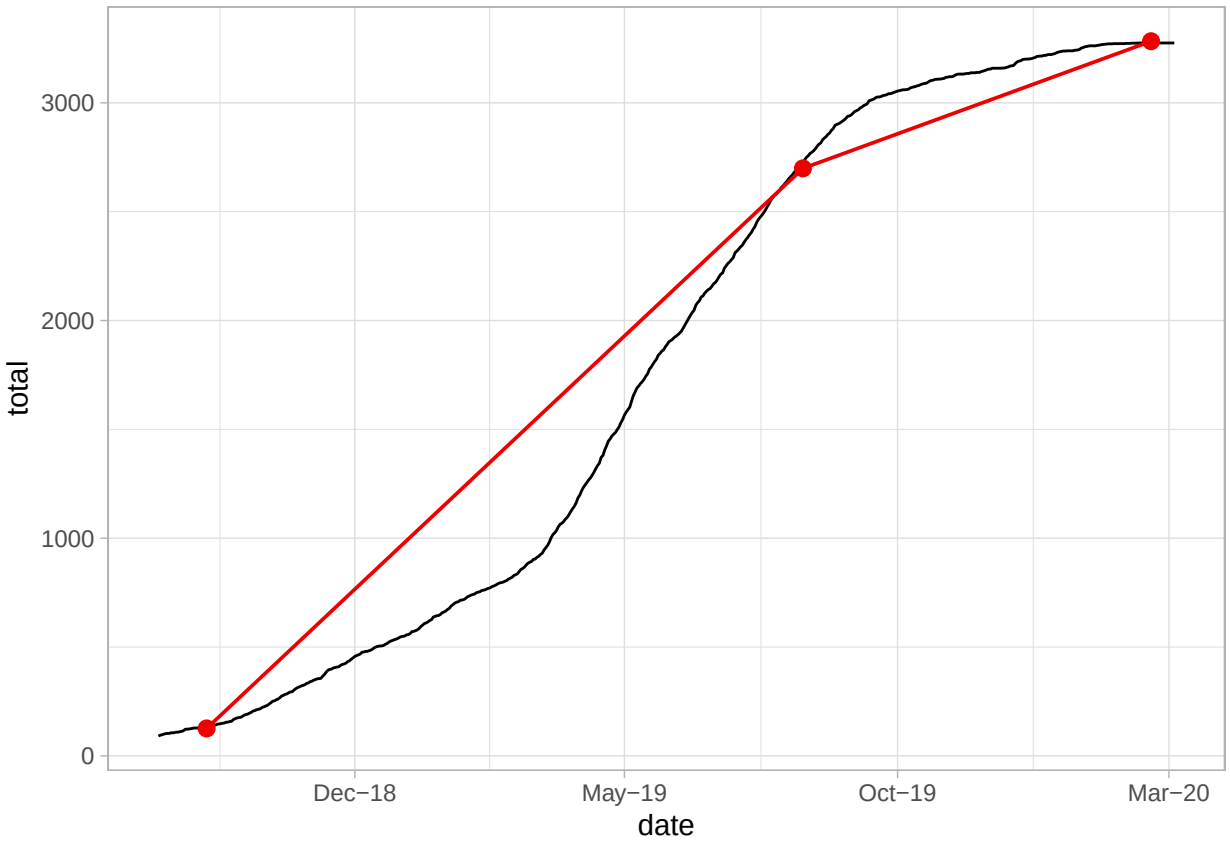



```
##
## $results
##   prior.date prior.total forecast.date actual.total forecast.total resids
## 1 2018-08-26         113    2018-09-02          128            120      8
## 2 2019-07-26        2591    2019-08-02         2660           2645     15
## 3 2020-02-06        3273    2020-02-13         3275           3278     -3
##
## $rmse
## [1] 9.966611
```

4.2 Hawkes 14-Day

```
print(h14 <- single_forecast(hr3, hpreds3, days = 14, point = T))
```

```
## $plot
```

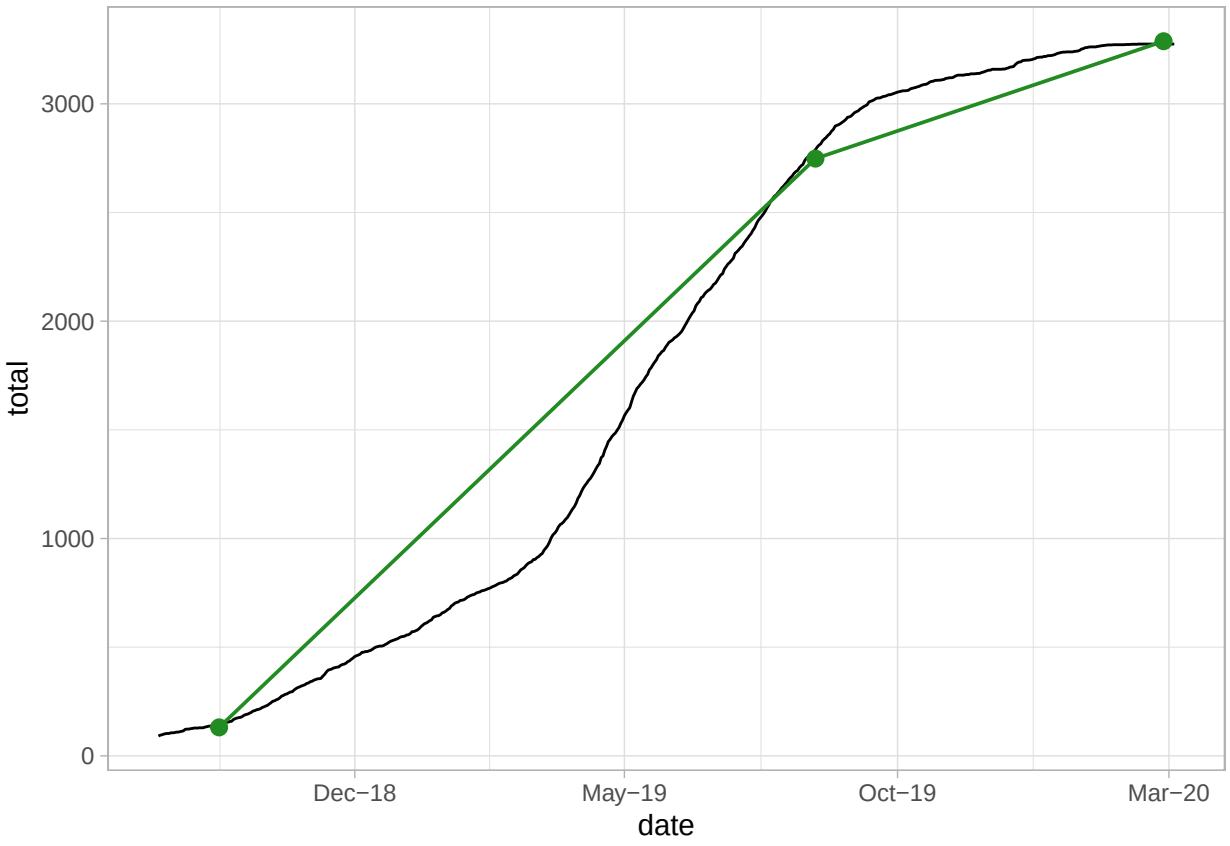



```
##
## $results
##   prior.date prior.total forecast.date actual.total forecast.total resids
## 1 2018-08-26         113    2018-09-09          134            126      8
## 2 2019-07-26        2591    2019-08-09         2721           2699     22
## 3 2020-02-06        3273    2020-02-20         3275           3283     -8
##
## $rmse
## [1] 14.28286
```

4.3 Hawkes 21-Day

```
print(h21 <- single_forecast(hr3, hpreds3, days = 21, point = T))
```

```
## $plot
```



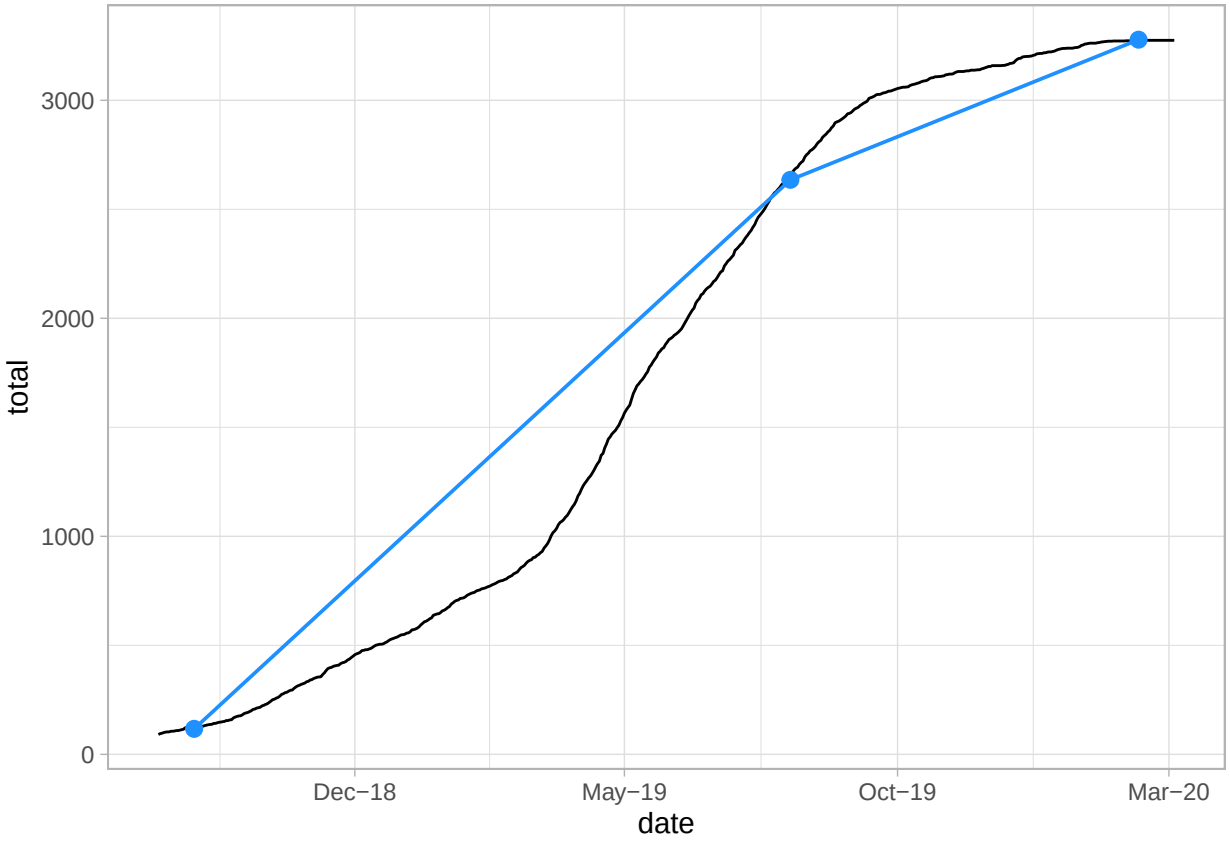

```
##
## $results
##   prior.date prior.total forecast.date actual.total forecast.total resids
## 1 2018-08-26         113    2018-09-16          147            131     16
## 2 2019-07-26        2591    2019-08-16         2789           2748     41
## 3 2020-02-06        3273    2020-02-27         3275           3288    -13
##
## $rmse
## [1] 26.49528
```

5 Recursive Forecasts

5.1 Recursive 7-Day

```
print(r7 <- single_forecast(hr3, rpreds3, days = 7, point = T))
```

```
## $plot
```

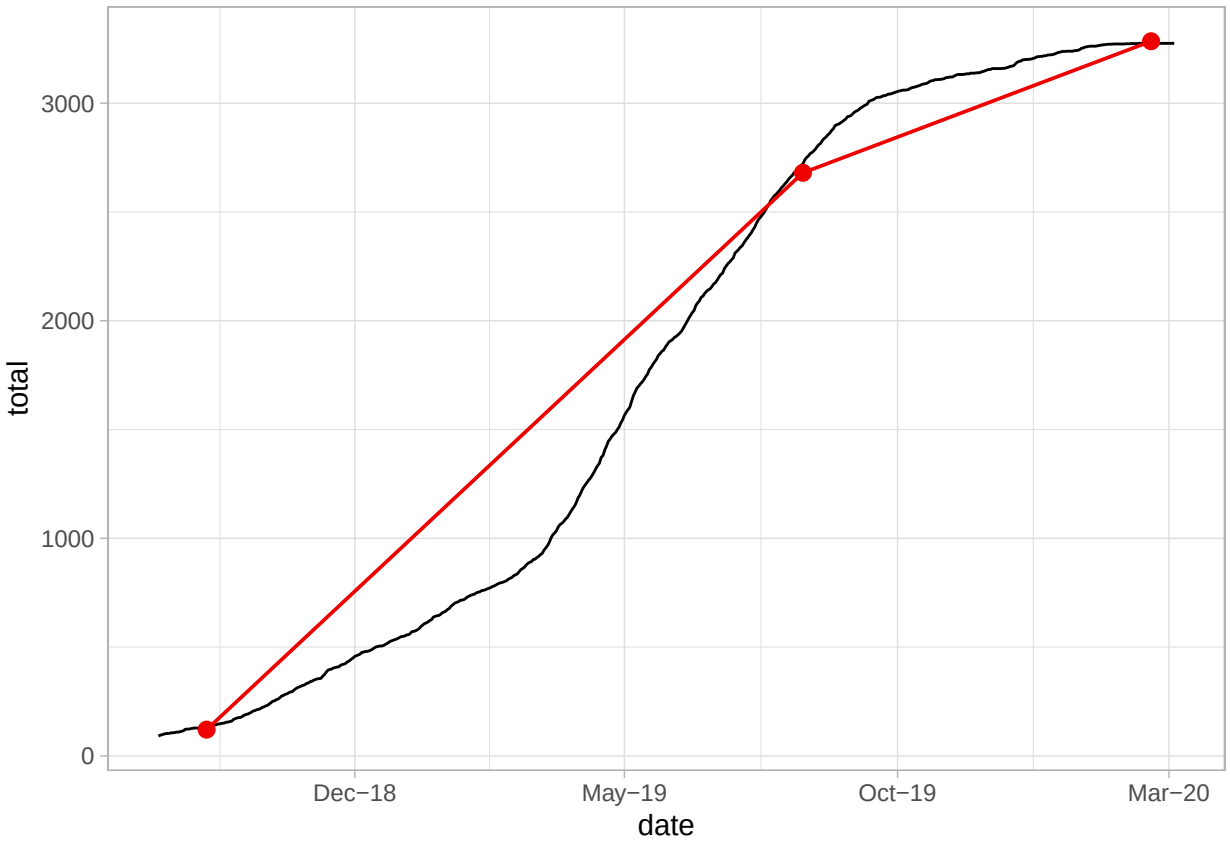



```
##
## $results
##   prior.date prior.total forecast.date actual.total forecast.total resids
## 1 2018-08-26         113    2018-09-02          128          117.0   11.0
## 2 2019-07-26        2591    2019-08-02         2660         2635.2   24.8
## 3 2020-02-06        3273    2020-02-13         3275         3278.0   -3.0
##
## $rmse
## [1] 15.75902
```

5.2 Recursive 14-Day

```
print(r14 <- single_forecast(hr3, rpreds3, days = 14, point = T))
```

```
## $plot
```

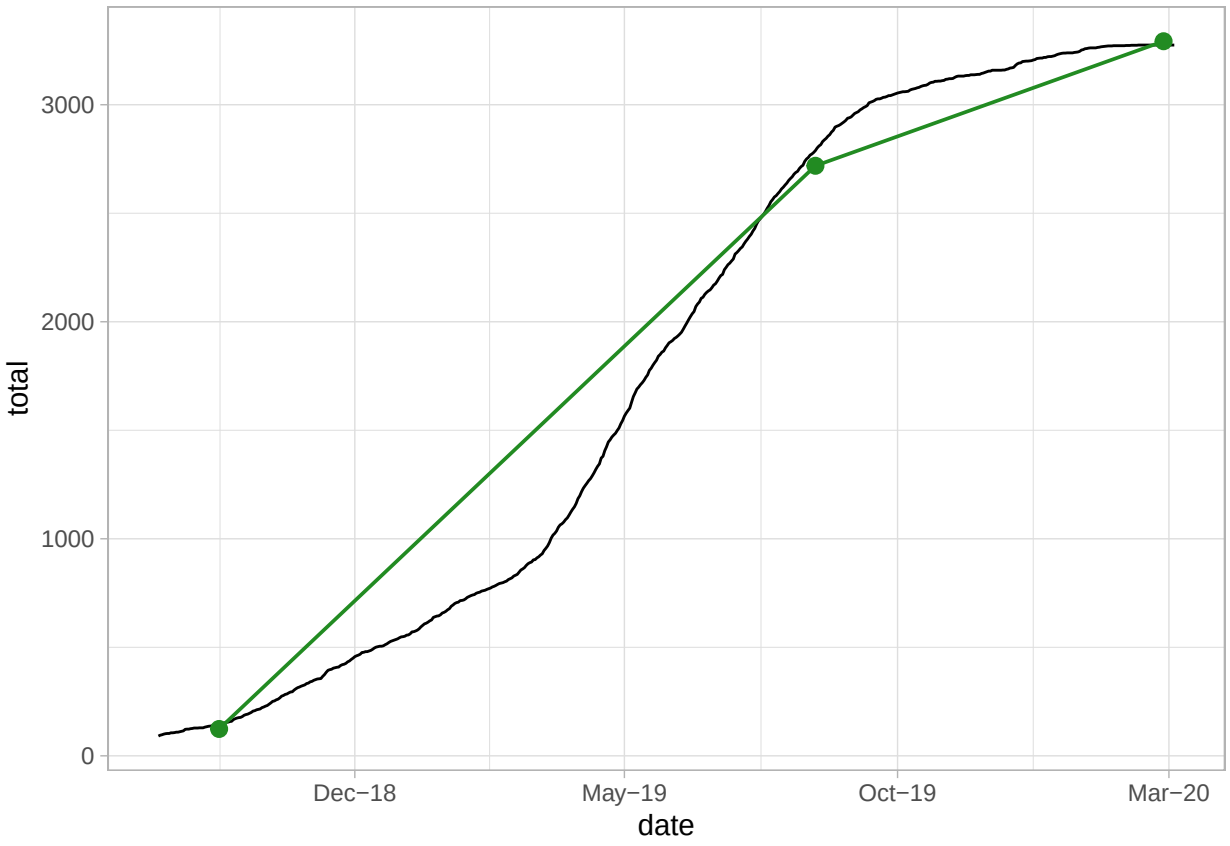



```
##
## $results
##   prior.date prior.total forecast.date actual.total forecast.total resids
## 1 2018-08-26         113    2018-09-09          134          120.6   13.4
## 2 2019-07-26        2591    2019-08-09         2721         2680.0   41.0
## 3 2020-02-06        3273    2020-02-20         3275         3284.7   -9.7
##
## $rmse
## [1] 25.52548
```

5.3 Recursive 21-Day

```
print(r21 <- single_forecast(hr3, rpreds3, days = 21, point = T))
```

```
## $plot
```




```
##
## $results
##   prior.date prior.total forecast.date actual.total forecast.total resids
## 1 2018-08-26         113    2018-09-16          147          123.7   23.3
## 2 2019-07-26        2591    2019-08-16         2789         2718.7   70.3
## 3 2020-02-06        3273    2020-02-27         3275         3292.6  -17.6
##
## $rmse
## [1] 43.94974
```

6 RMSE

Table 1: RMSE values for 3 selected datasets.

	Hawkes	Recursive
7-day	9.97	15.76
14-day	14.28	25.53
21-day	26.50	43.95