

# Ebola Forecasting - Important Figures

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## 1 Dataset Selection

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

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

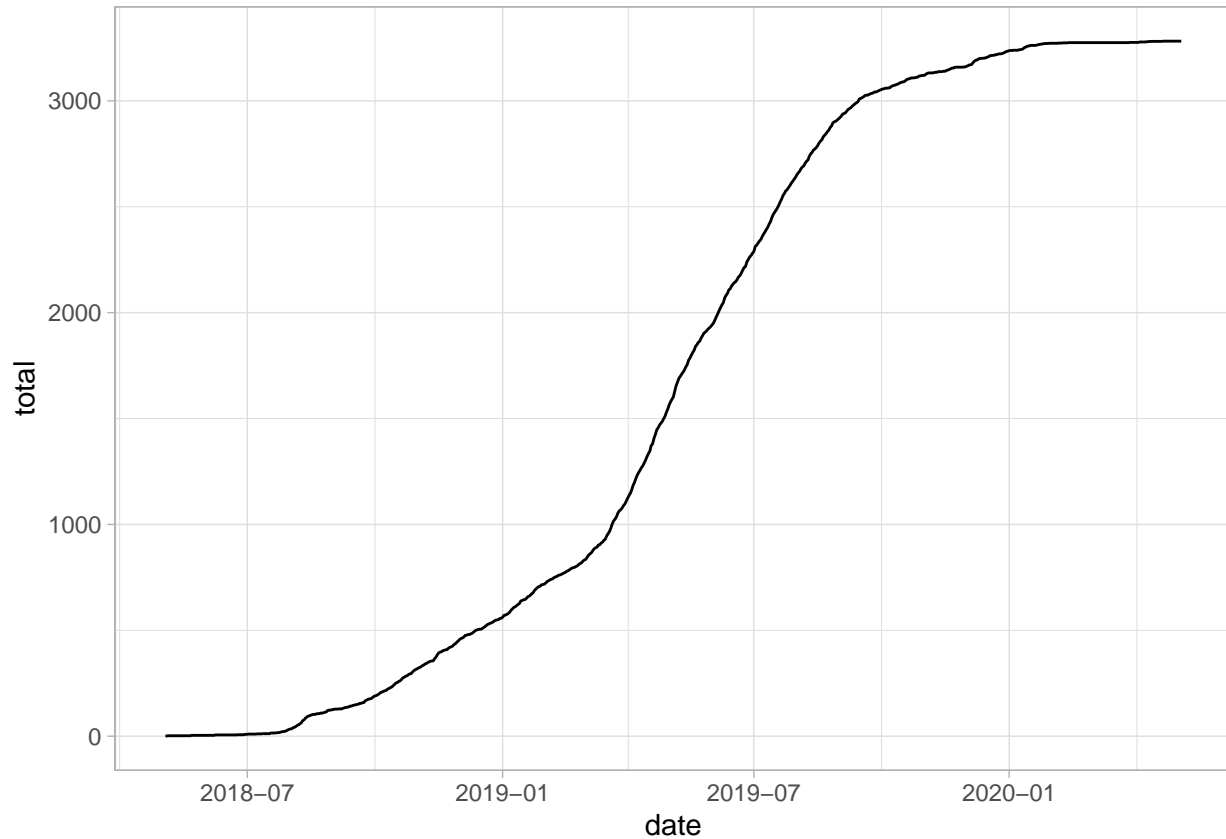
```
##           2 164 176  
## pred.7    7  54   5  
## pred.14  13 108  10  
## pred.21  18 157  15
```

```
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

```
ggplot(  
  data = true,  
  mapping = aes(x = date, y = total)  
) + geom_line() + theme_light()
```

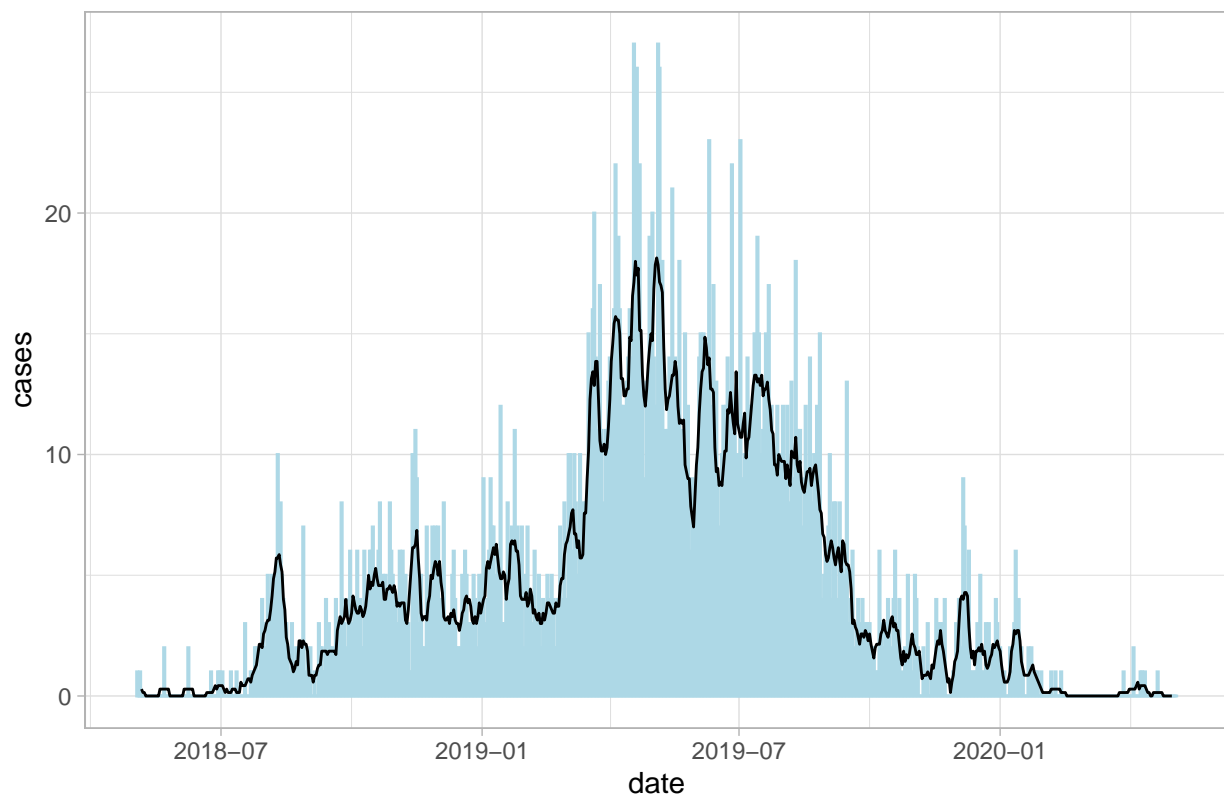


## 3 New Cases by Day

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

```
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"  
  ) + labs(title = title) + theme(legend.position = "bottom")
```

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

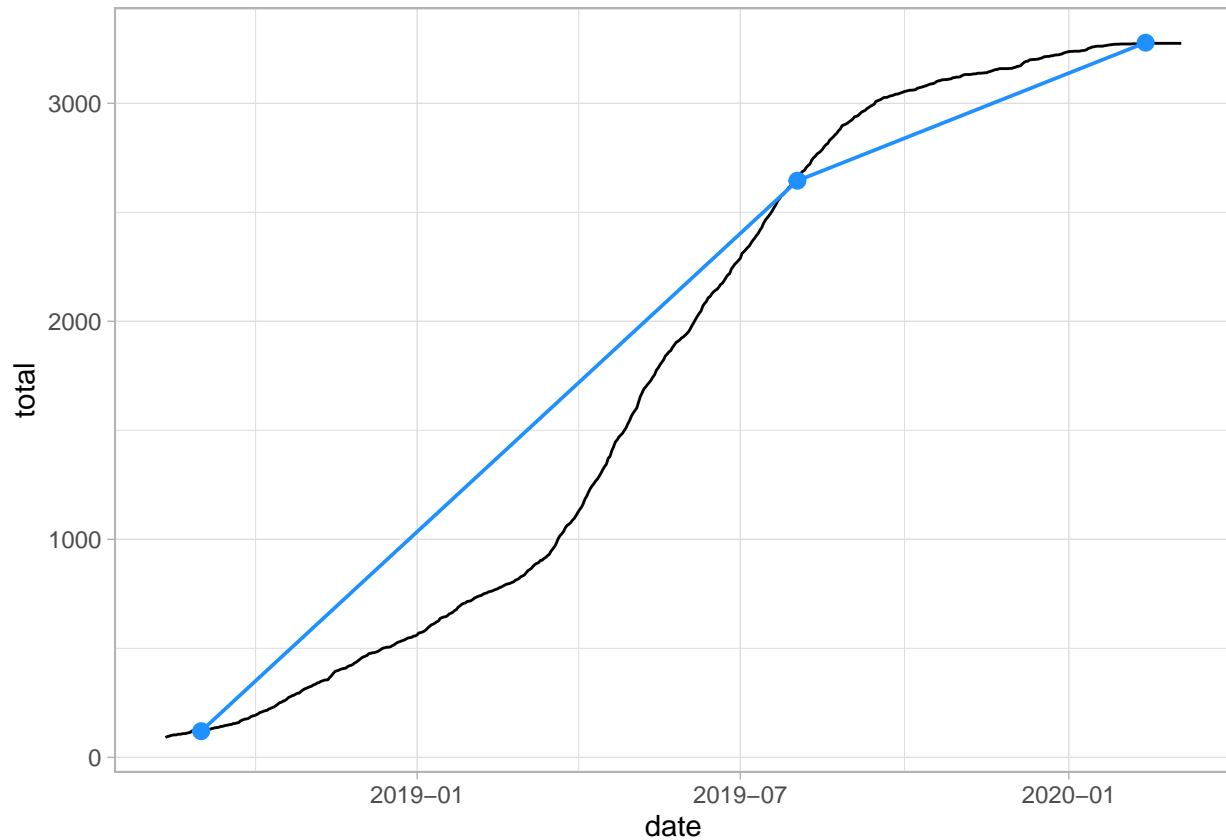


## 4 Hawkes Forecasts

### 4.1 Hawkes 7-Day

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

```
## $plot
```

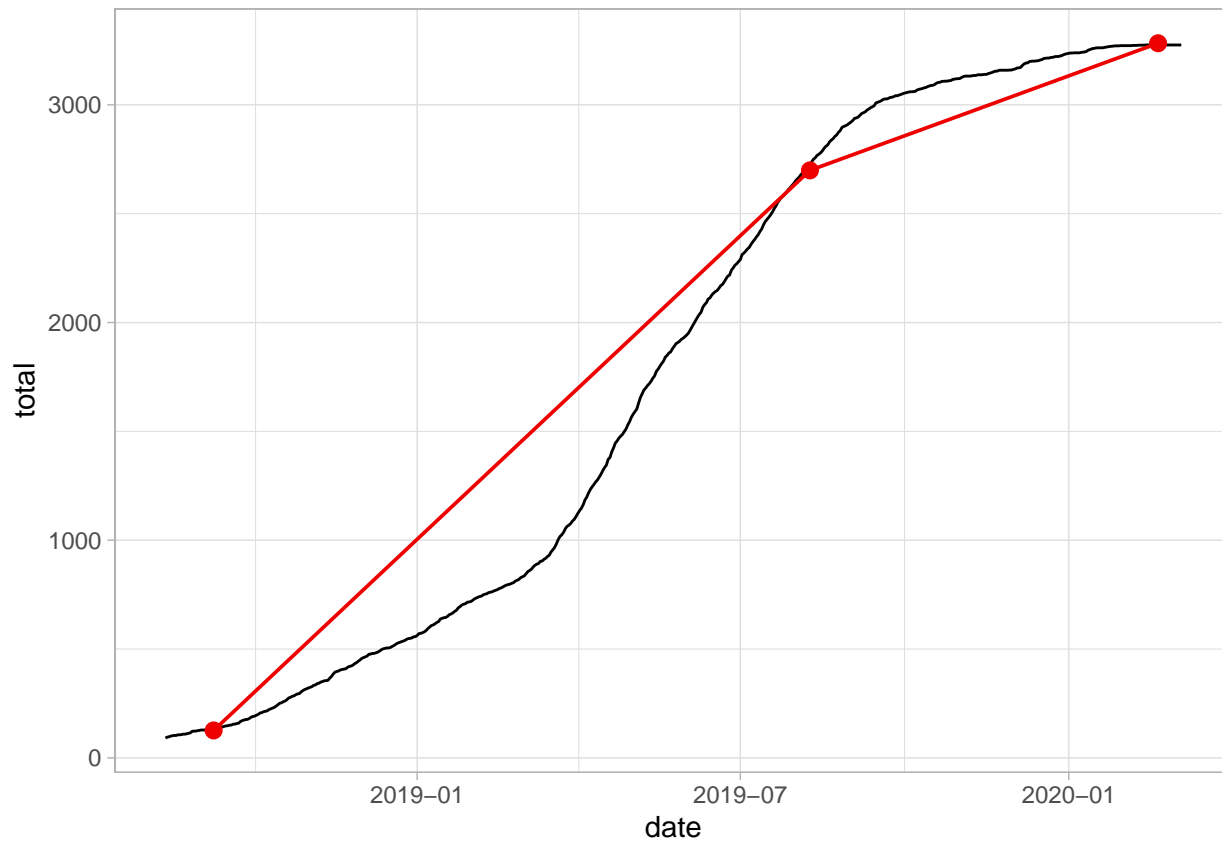


```
##
## $results
##   prior.date prior.total forecast.date actual.total forecast.total resid
## 1 2018-08-26      113    2018-09-02      128         120         8
## 2 2019-07-26     2591    2019-08-02     2660        2645        15
## 3 2020-02-06     3273    2020-02-13     3275        3278      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

```
##
```

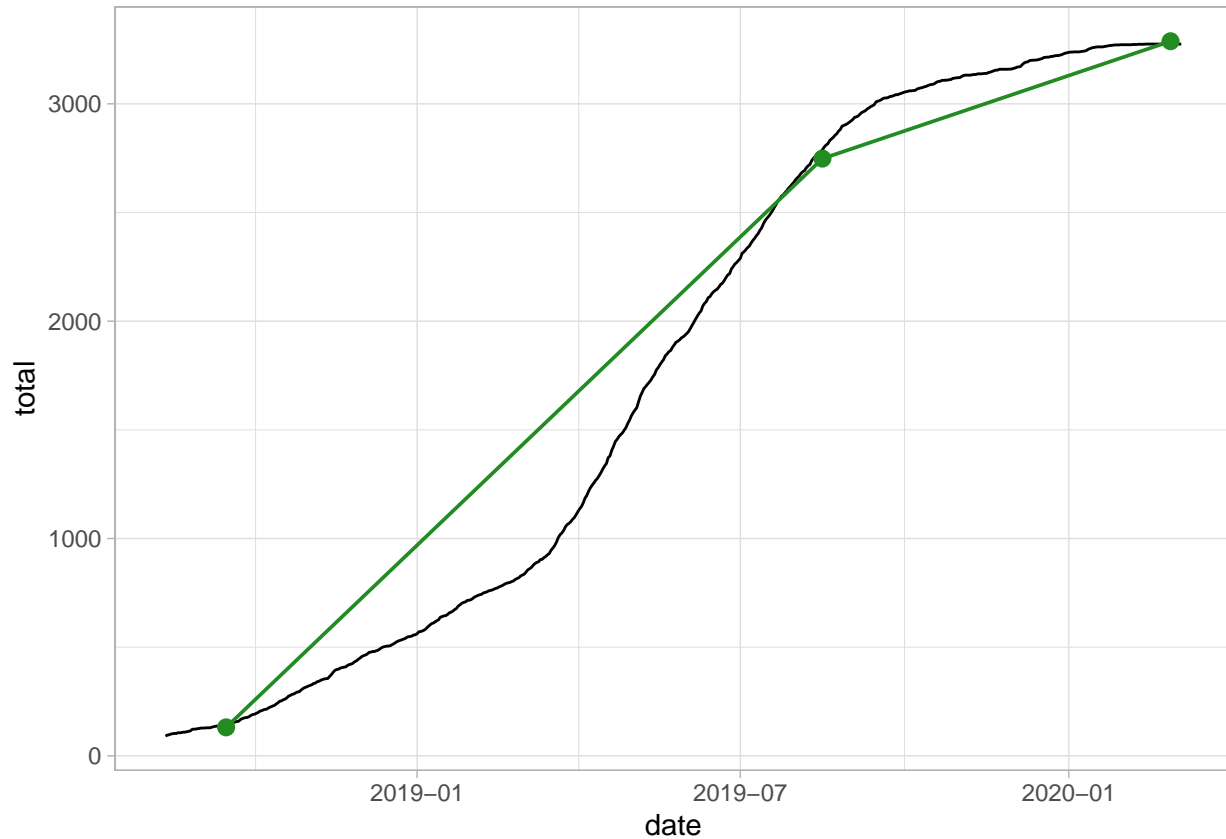
```
## $rmse
```

```
## [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
```

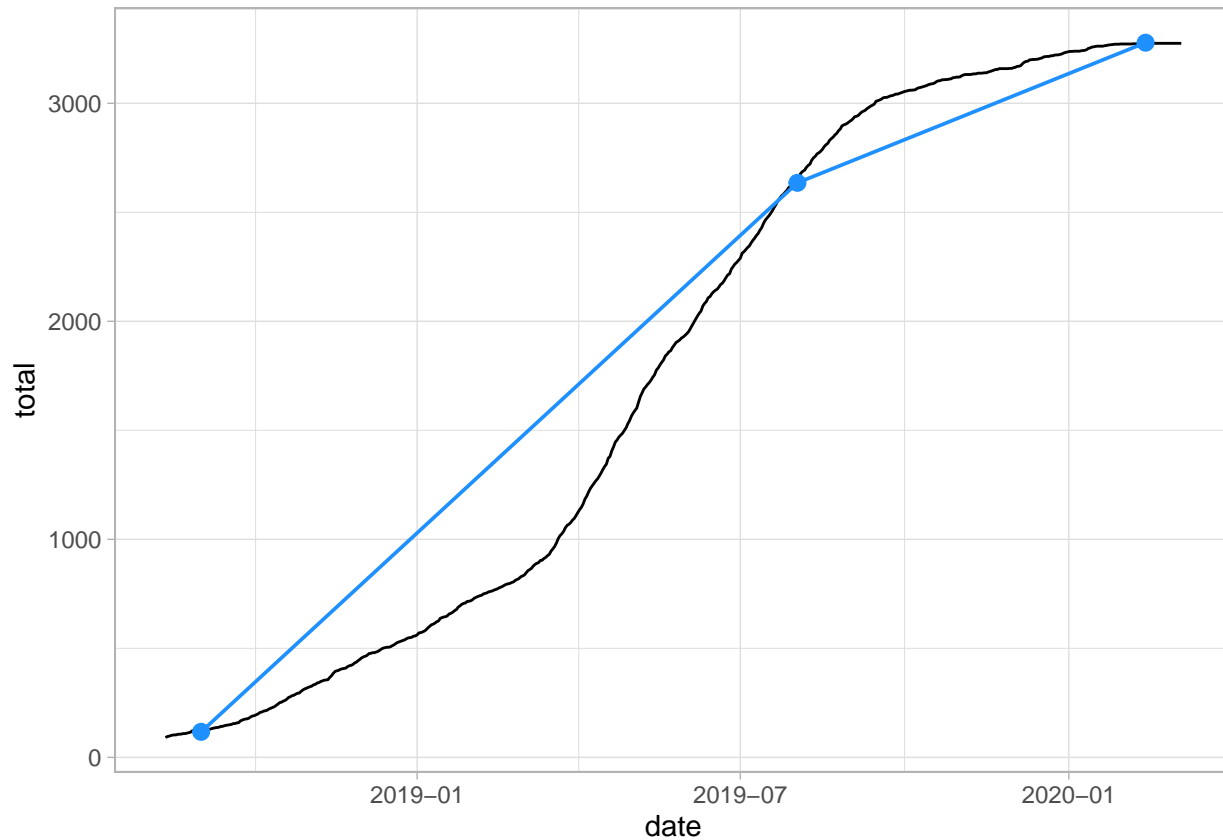
```
## [1] 26.49528
```

## 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

```
##
```

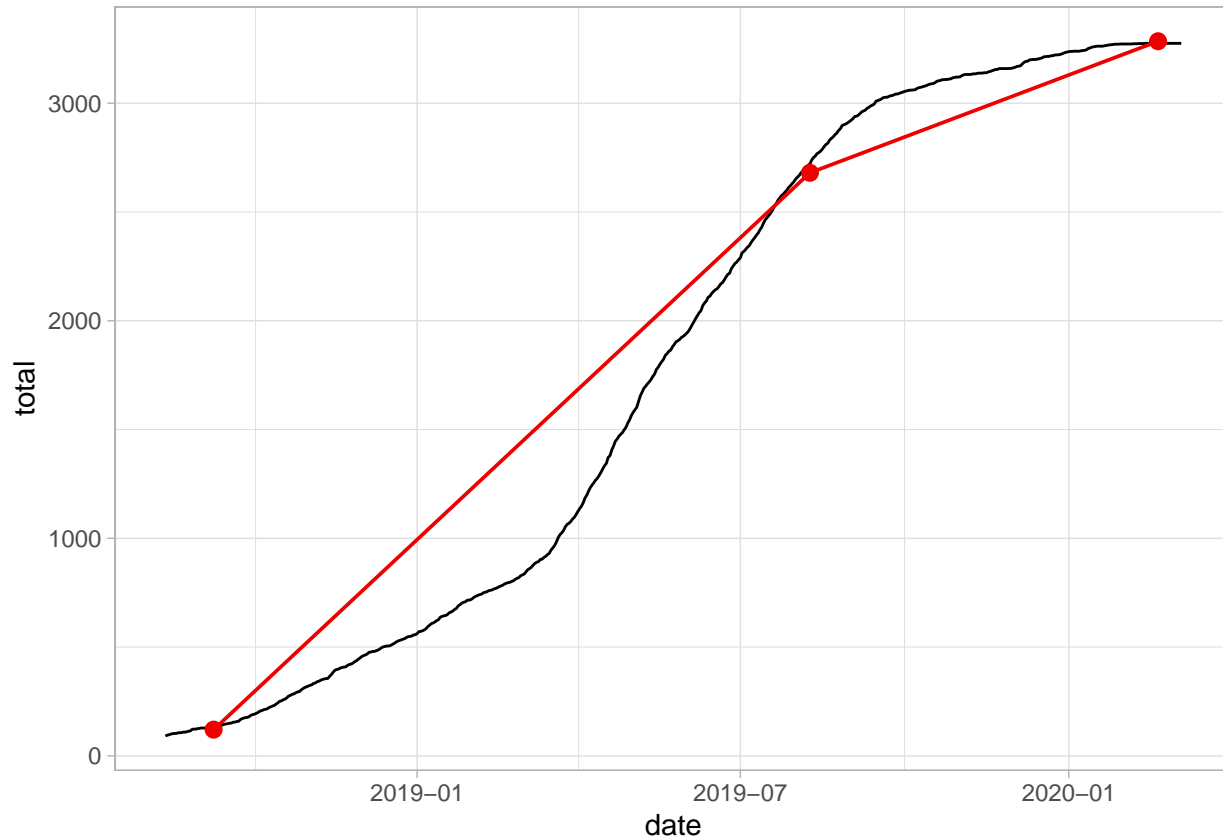
```
## $rmse
```

```
## [1] 15.75902
```

## 5.2 Recursive 14-Day

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

```
## $plot
```



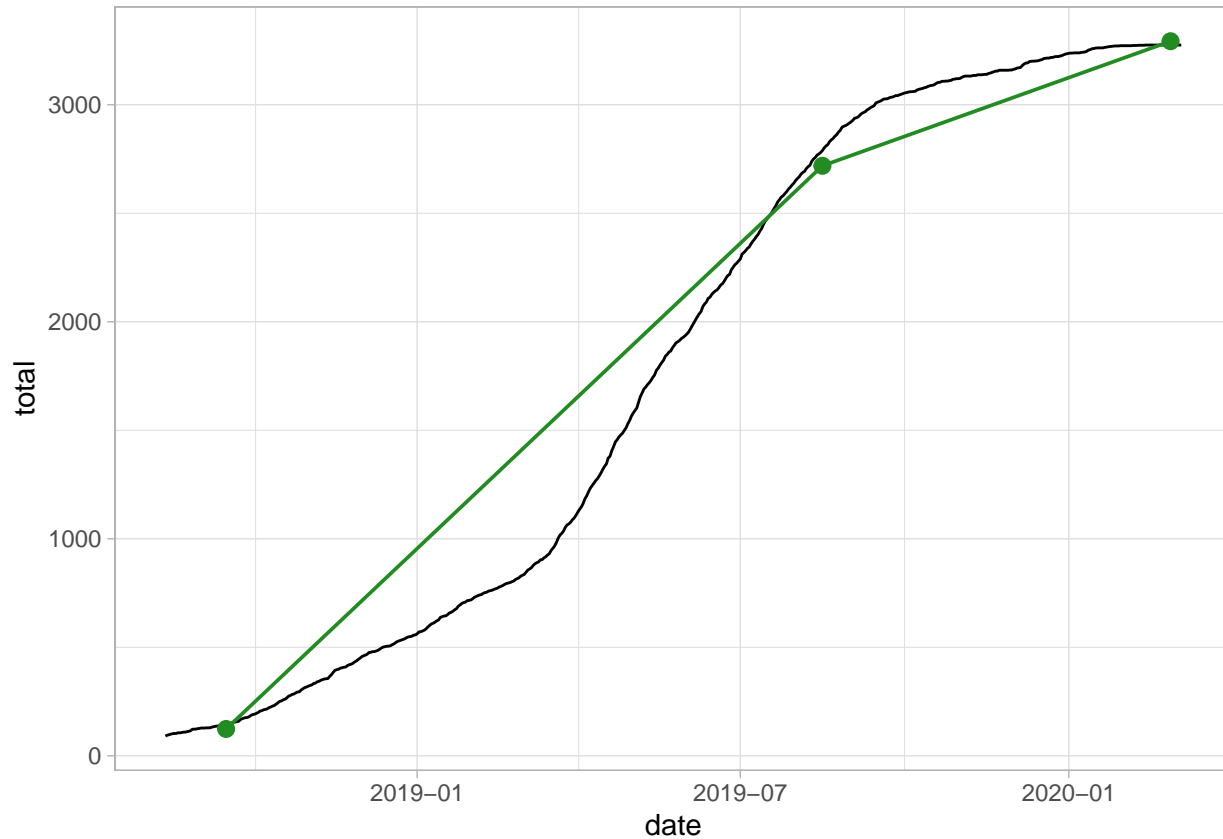
```
##
## $results
##   prior.date prior.total forecast.date actual.total forecast.total resid
## 1 2018-08-26      113    2018-09-09      134        120.6    13.4
## 2 2019-07-26     2591    2019-08-09     2721        2680.0    41.0
## 3 2020-02-06     3273    2020-02-20     3275        3284.7   -9.7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