Wrap up

Mengyu Zhang

3/22/2021

Prepare data

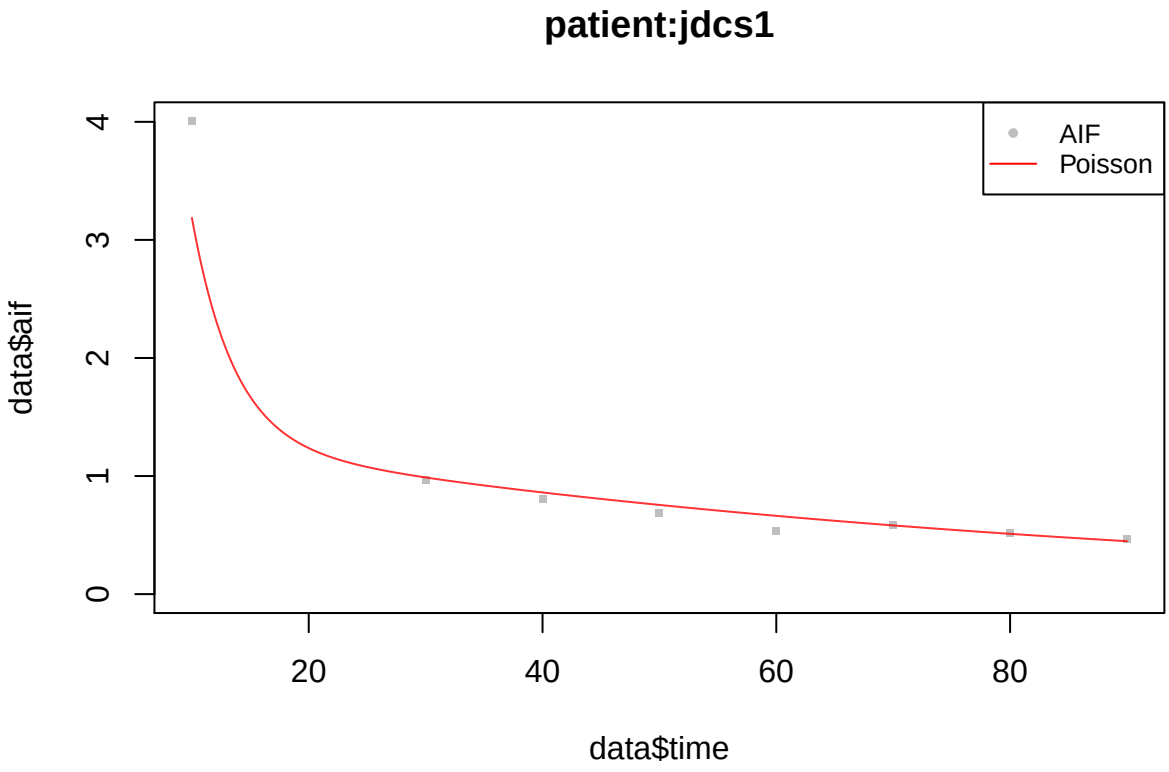
```
# load data
data = readdata()
# find tmax and slice the curve
data = data %>%
  group_by(patient) %>%
  mutate(count = map(count,~findtmax(.x)),
         count_asc = map(count, ~slice_asc(.x)), # data before tmax
         count_dsc = map(count, ~slice_exp(.x))) # data after tmax
```

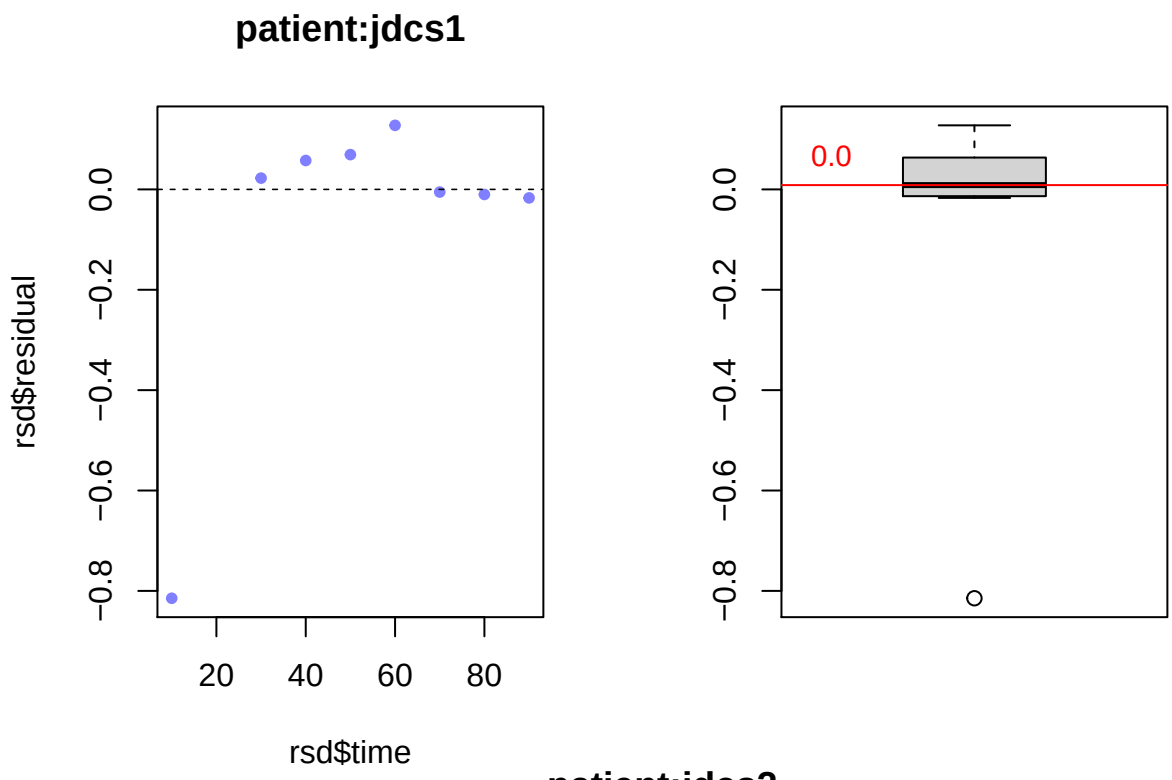
Fit model

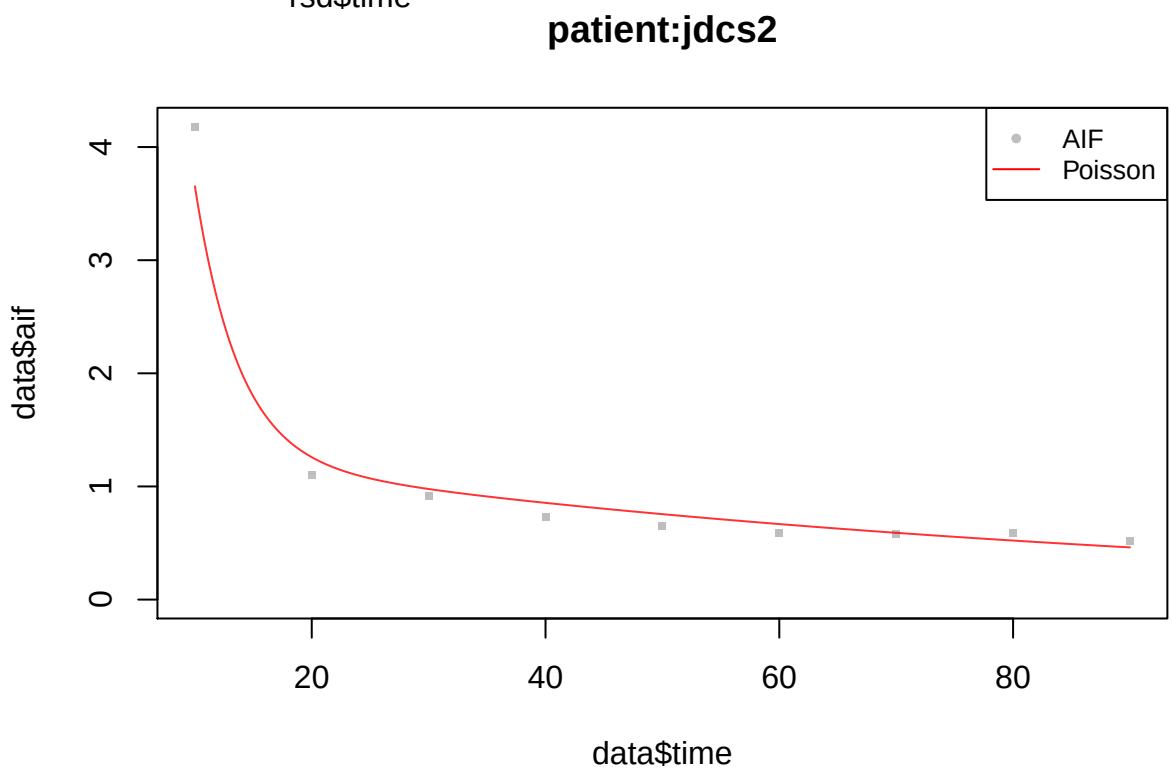
```
data = data %>%
  group_by(patient) %>%
  mutate(asc_res = map(count_asc, ~acs_inter(.x)), # detect t0 and interpolate aif between t0 and tmax
         count_asc = map(asc_res, ~.x$data), # add t0 to the data
         asc_mod = map(asc_res, ~.x$segmod), # save model that detecting t0
         dsc_mod = map(count_dsc, # fit nonlinear poisson regression for descending part
                       ~kinfitr_gnm(t = .x$time, # time since tmax
                                    t_G = .x$t_G, # time point put in gamma count since injection time
                                    y.sum = .x$count,
                                    delta = .x$delta, # time in the gamma counter
                                    vol = .x$vol,
                                    pf = .x$parentFraction,
                                    bpr = .x$bpr,
                                    disp = rep(1,nrow(.x))
                                    )
                       ),
         dsc_mod = map(dsc_mod, ~.x$result), # save model fit data after tmax
         asc_pred = map(asc_res, ~.x$pred), # get prediction before tmax
         # get prediction after tmax, contain interpolated aif
         dsc_pred = map2(dsc_mod,count_dsc,~pred_aif(.x,.y)),
         pred = map2(asc_pred,dsc_pred,~rbind(.x,.y$rsd[-1,])), # combine predicted aif
         rsd = map2(count, pred, ~add_residual(.x,.y)) # calculate residuals
         ) %>%
  select(-asc_res)
```

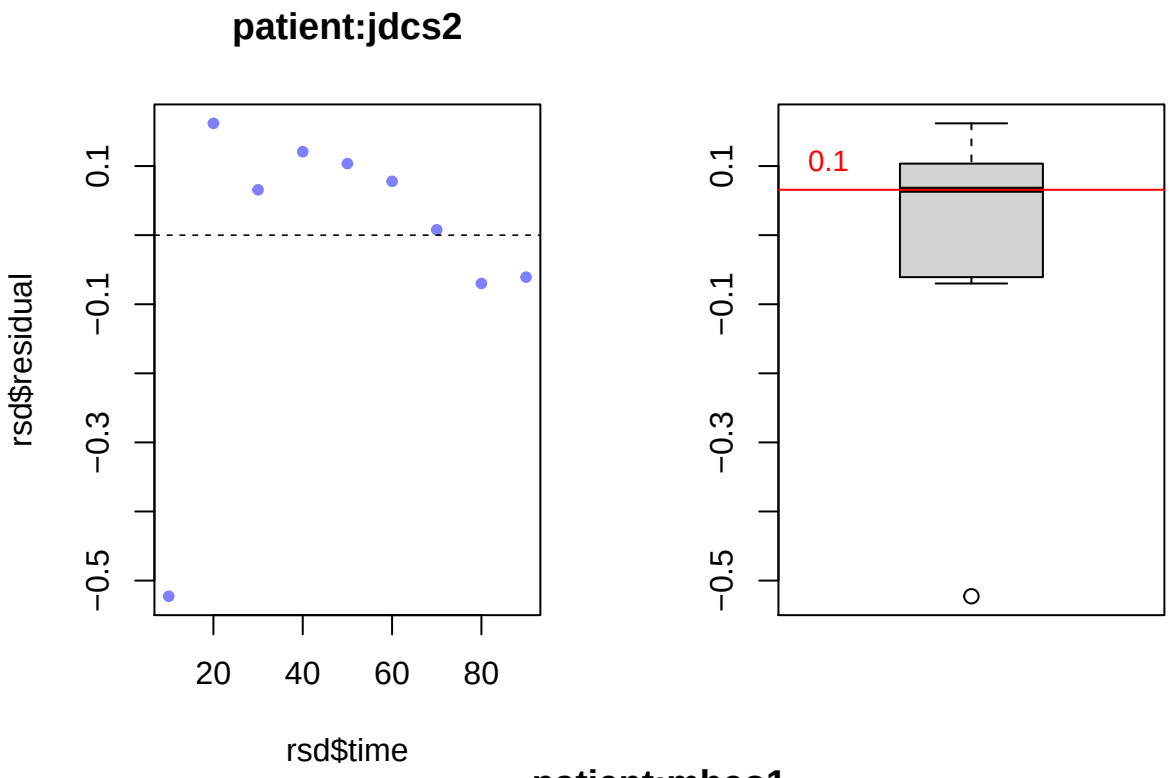
plot

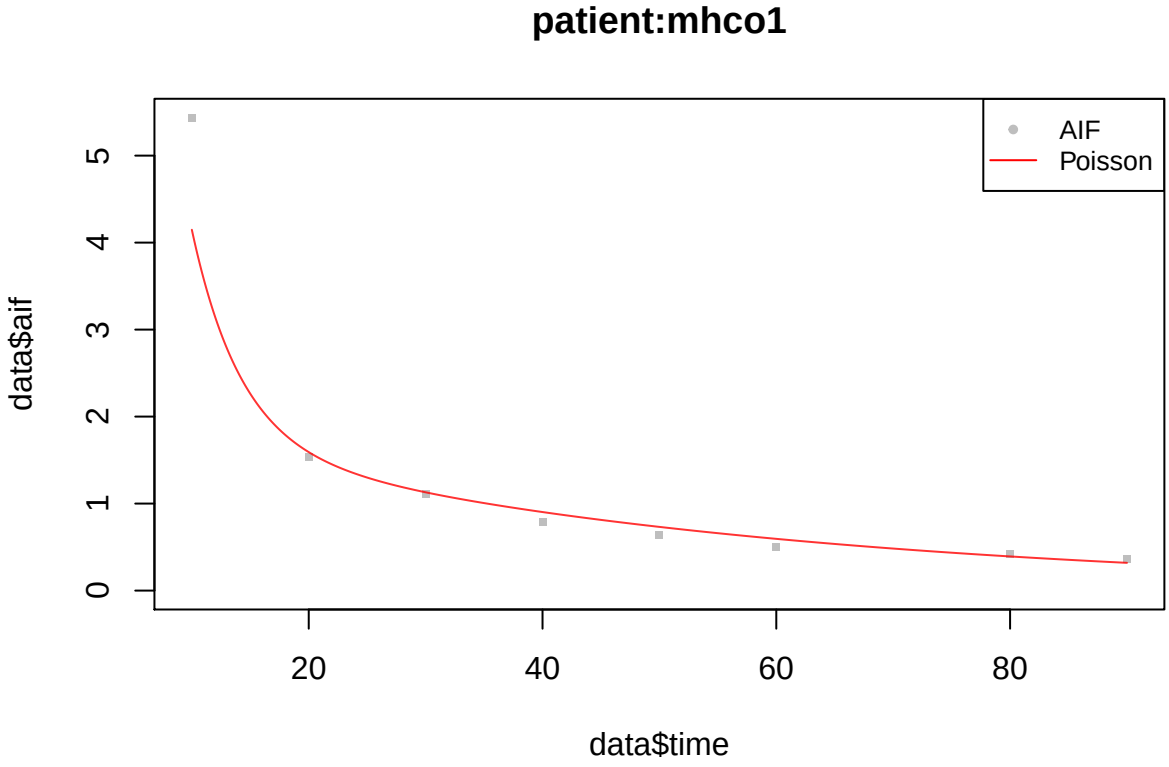
```
for (i in 1:nrow(data)){
  par(mfrow=c(1,1))
  # change range of time by using 2nd and 3rd arguments
  scope_whole(data[i,],10,90) # plot aif and predicted aif
  plot_rsd(data[i,],10,90) # plot residuals and boxplot with median
}
```

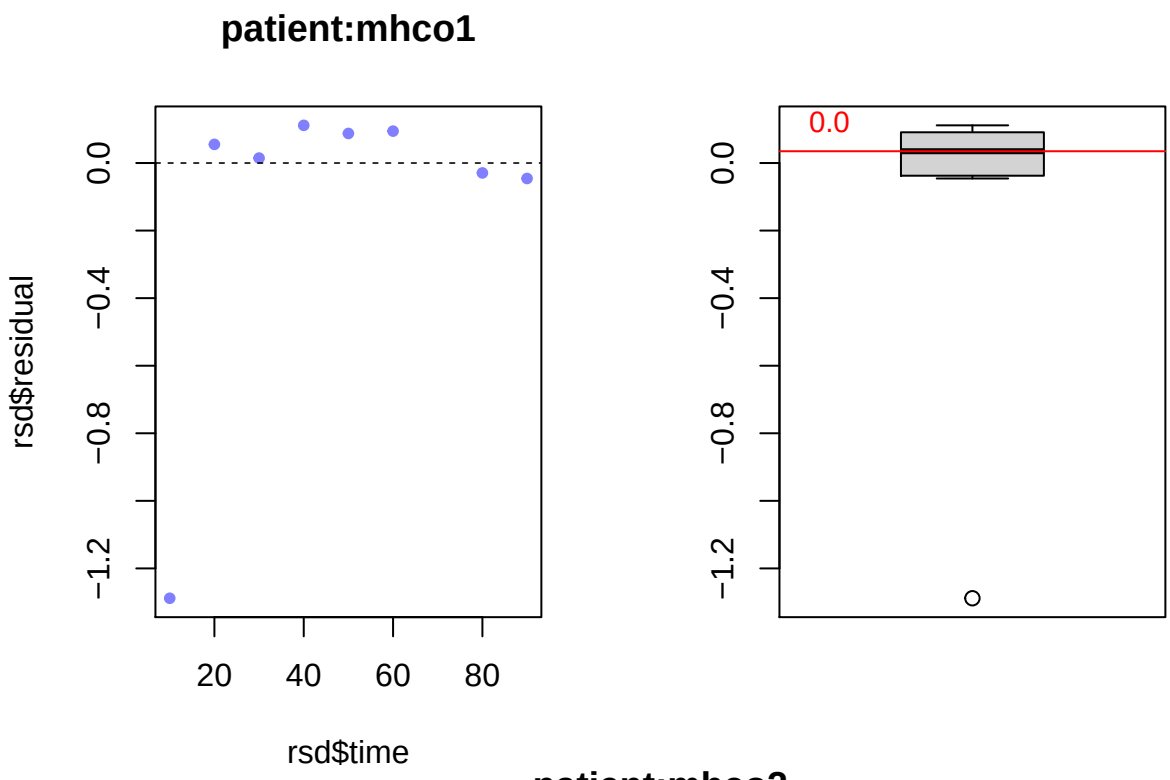


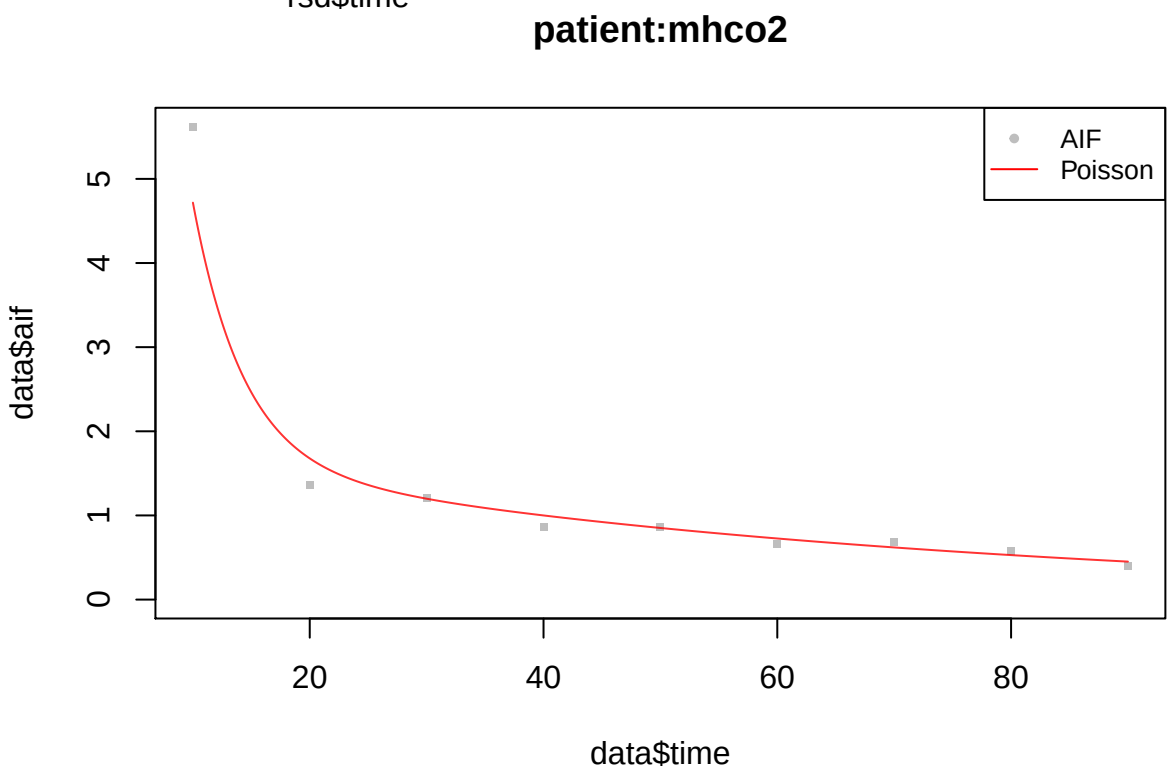

patient:jdcs1
rsd$residual
0.0
−0.2
−0.4
−0.6
−0.8
20
40
60
80
rsd$time
0.0
−0.2
−0.4
−0.6
−0.8

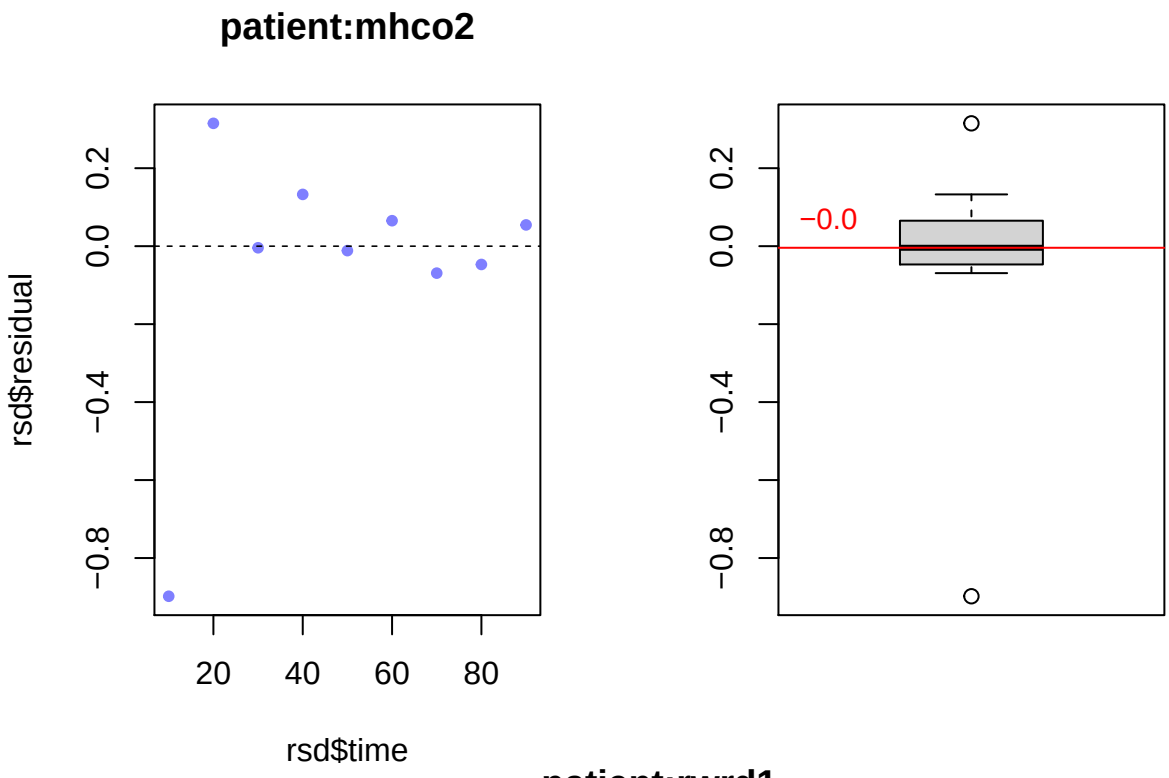

patient:jdcs2
data$aif
0
1
2
3
4
20
40
60
80
data$time
AIF
Poisson

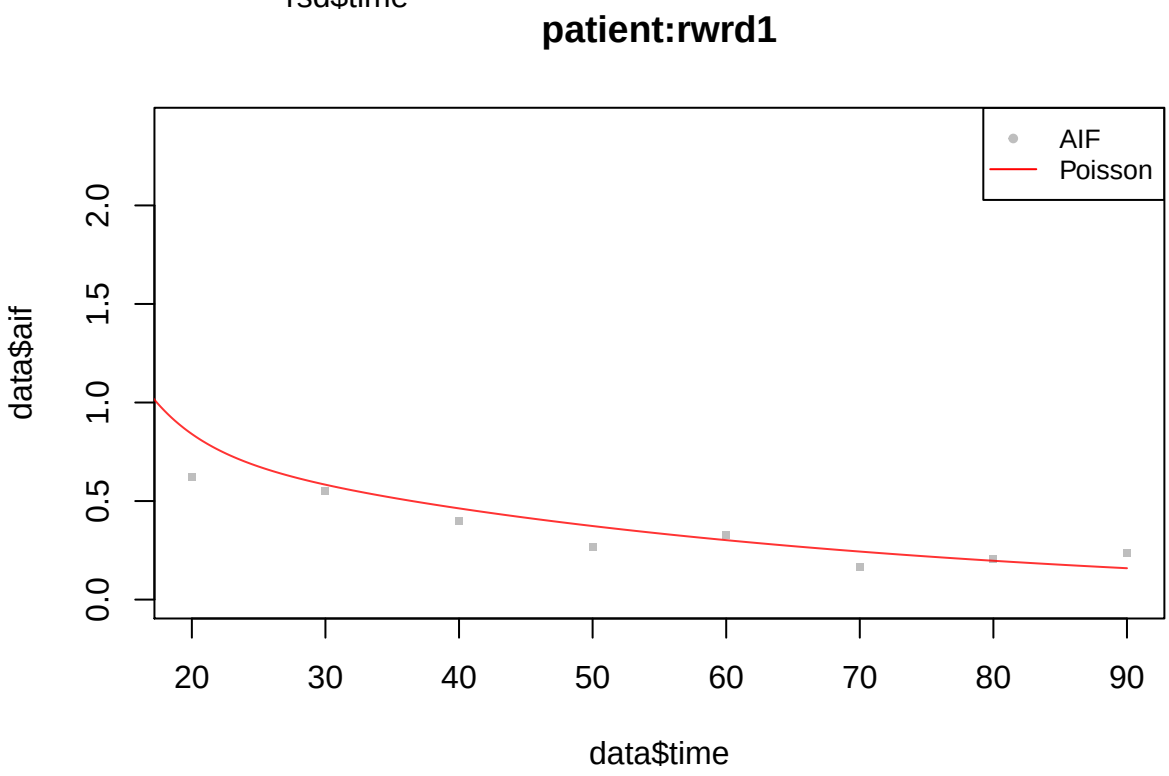

patient:jdcs2
rsd$residual
rsd$time
0.1
20
40
60
80
−0.5
−0.3
−0.1
0.1

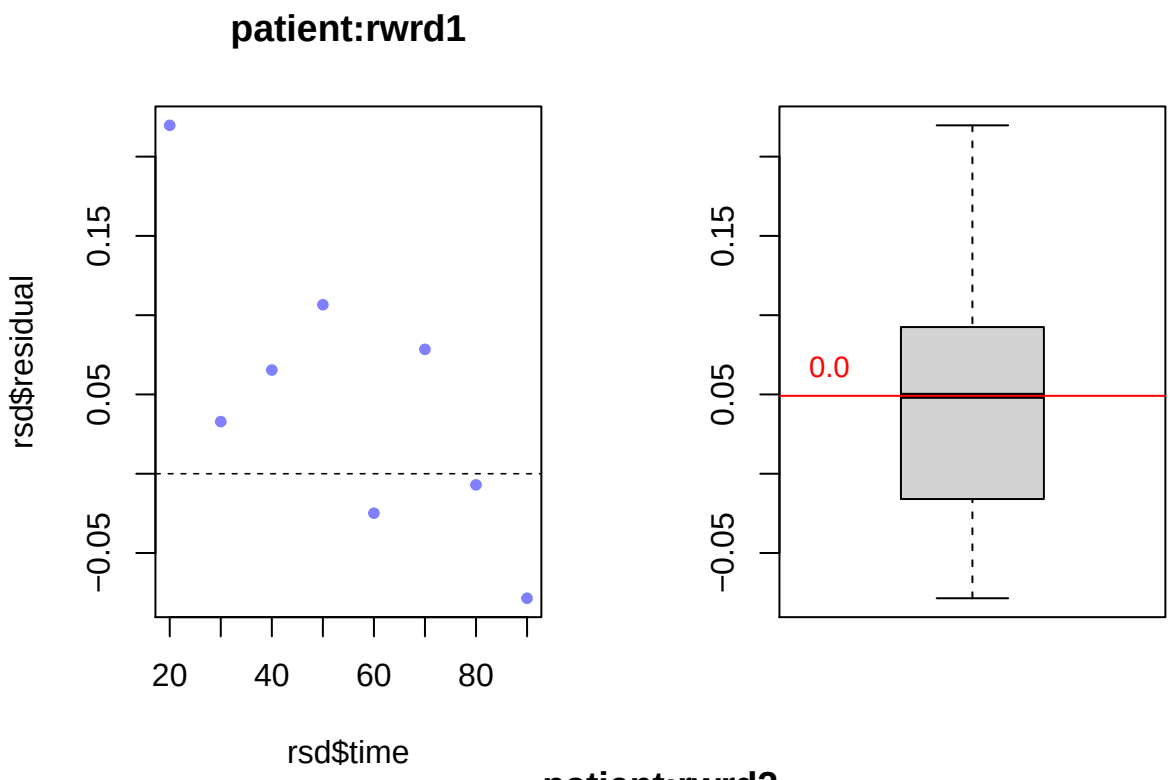

patient:mhco1
data$aif
data$time
AIF
Poisson
0
1
2
3
4
5
20
40
60
80

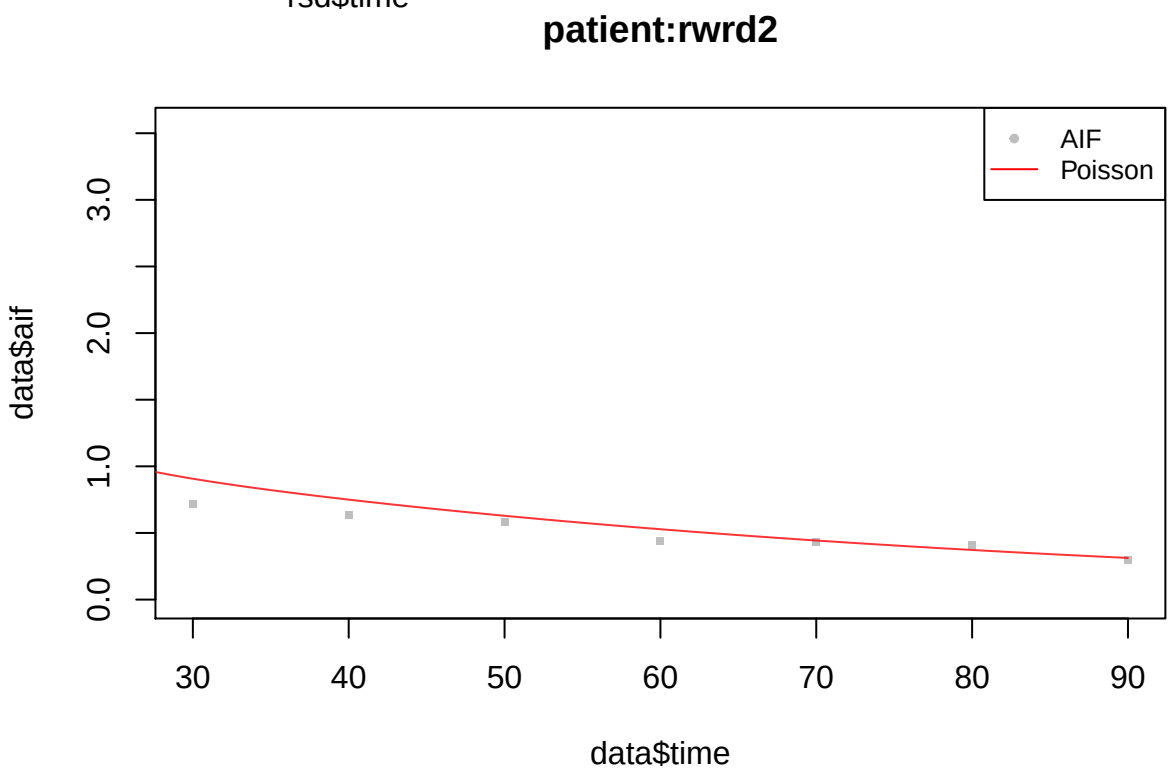

patient:mhco1
rsd$residual
0.0
−0.4
−0.8
−1.2
20
40
60
80
rsd$time
0.0
−0.4
−0.8
−1.2

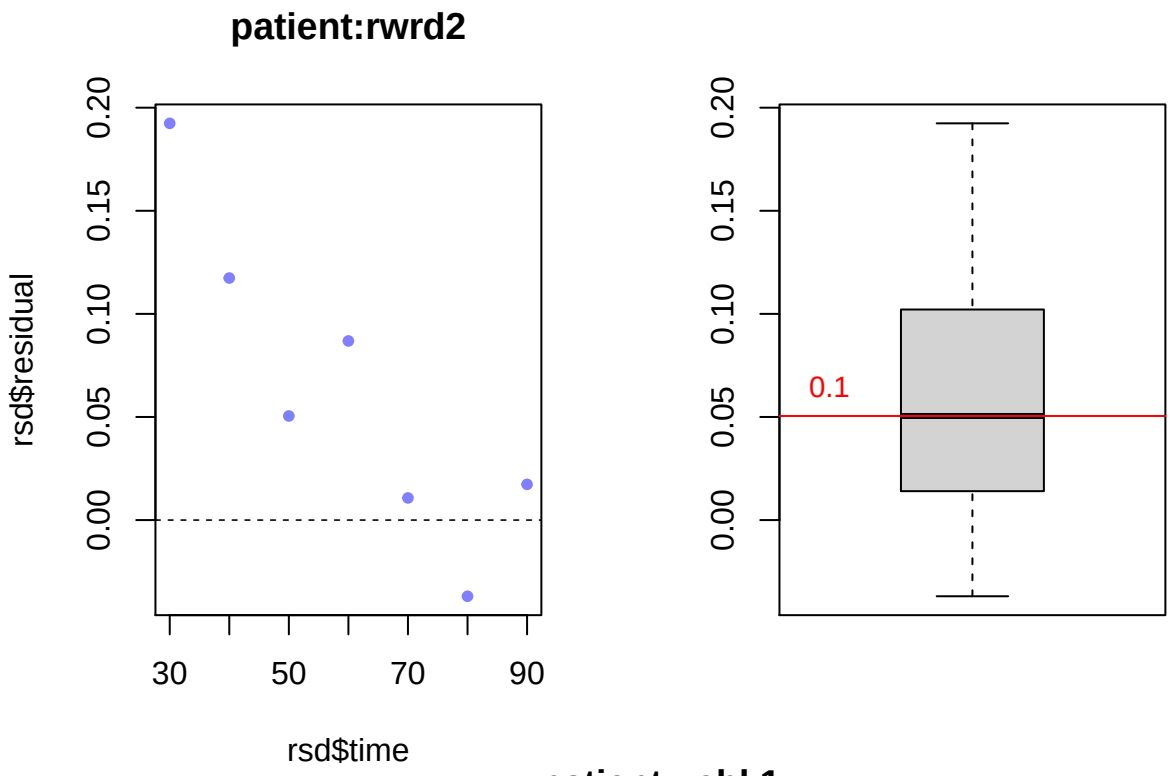

patient:mhco2
data$aif
0
1
2
3
4
5
AIF
Poisson
20
40
60
80
data$time

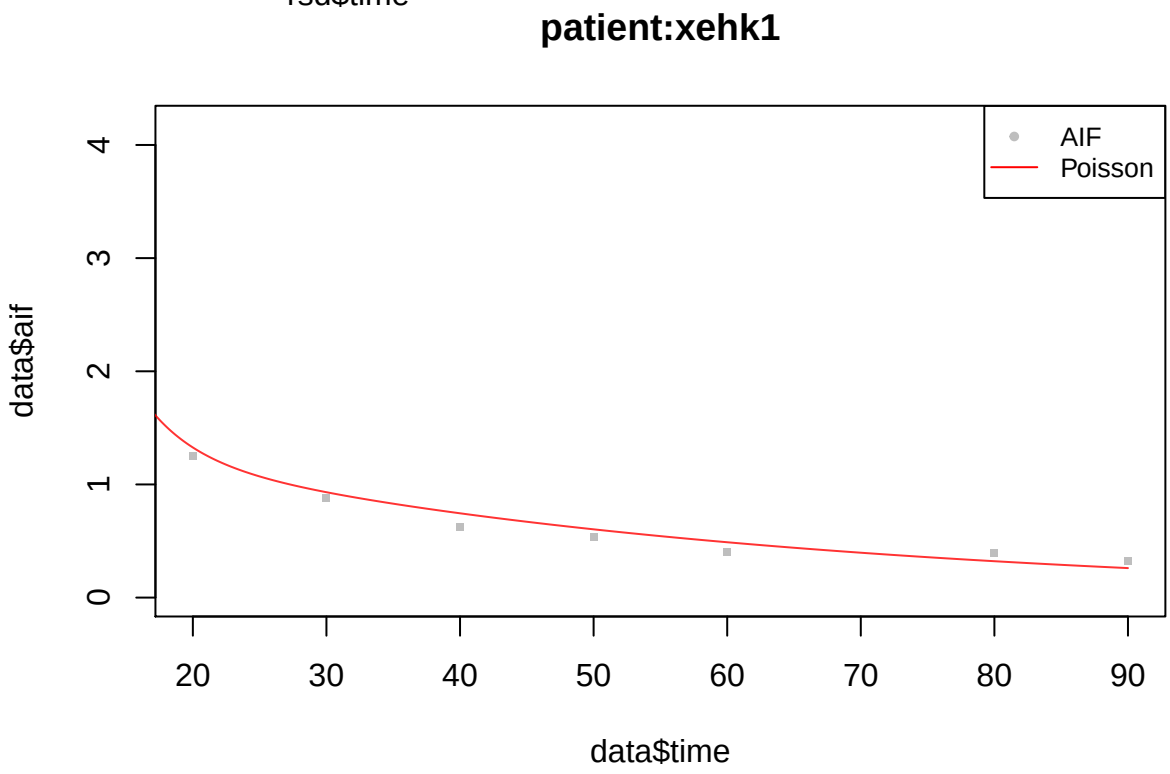

patient:mhco2
rsd$residual
0.2
0.0
−0.4
−0.8
20
40
60
80
rsd$time
−0.0

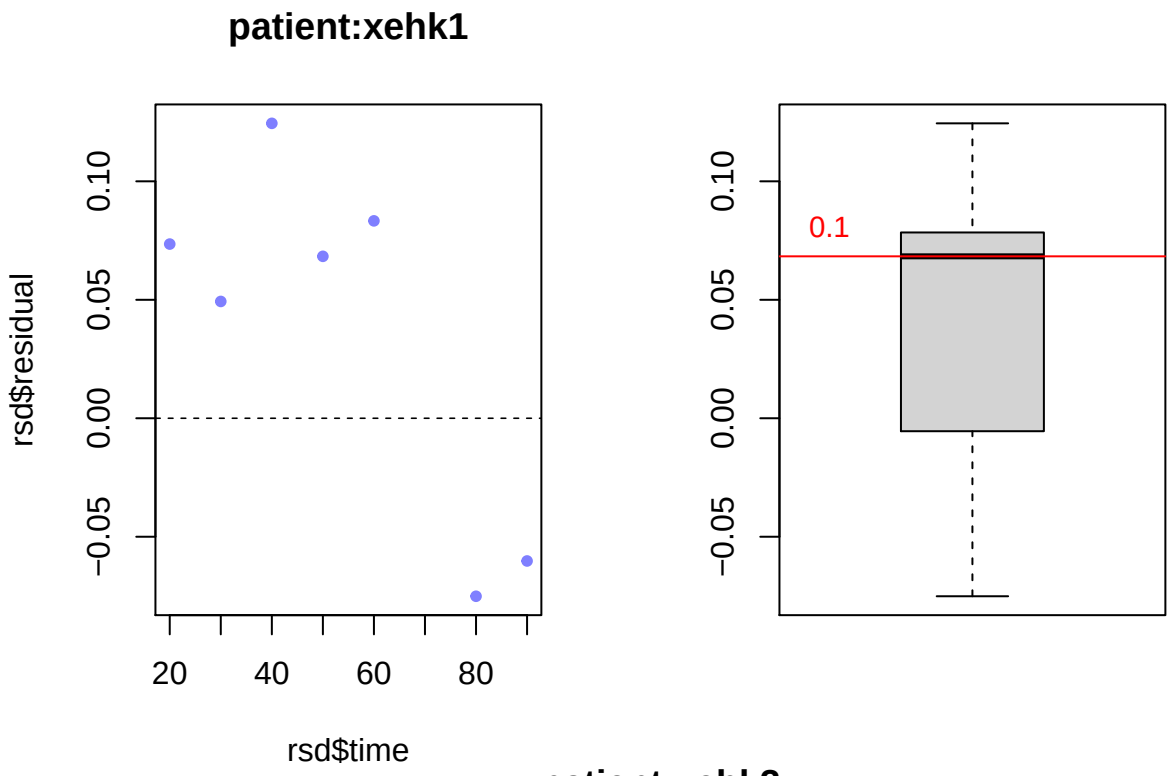

patient:rwrd1
data$aif
0.0
0.5
1.0
1.5
2.0
20
30
40
50
60
70
80
90
data$time
AIF
Poisson

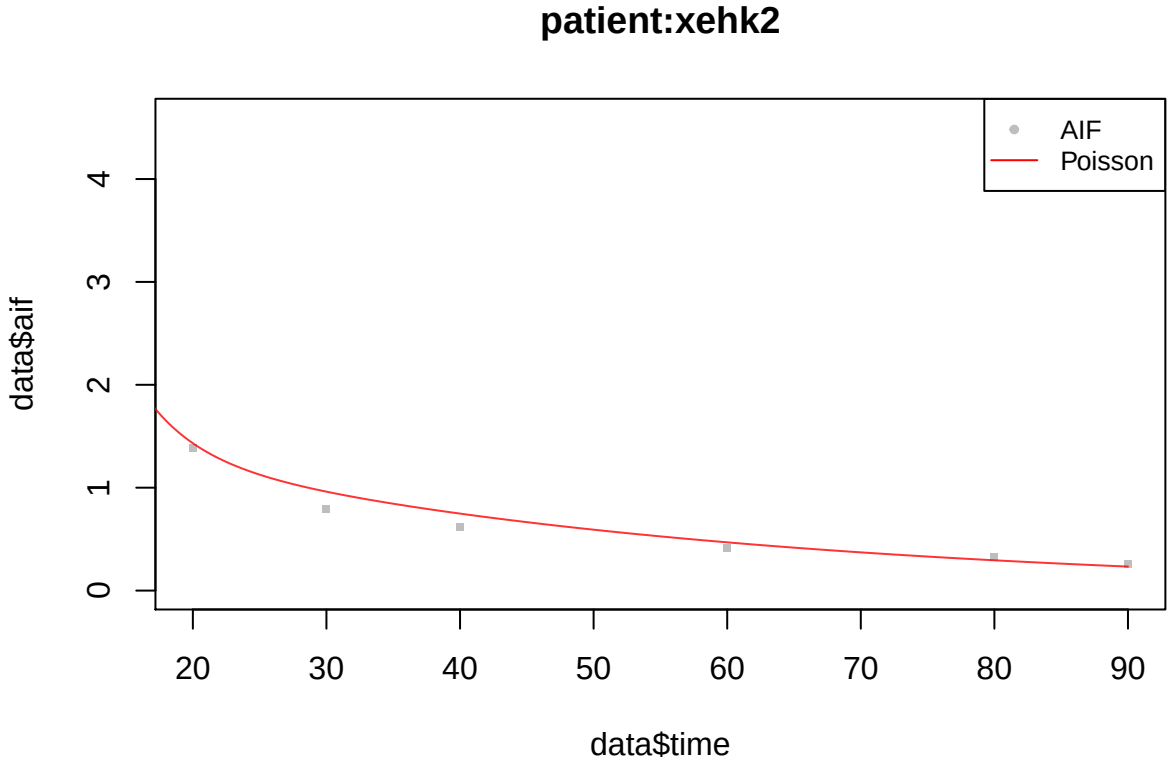

patient:rwrd1
rsd$residual
0.15
0.05
−0.05
20
40
60
80
rsd$time
0.0

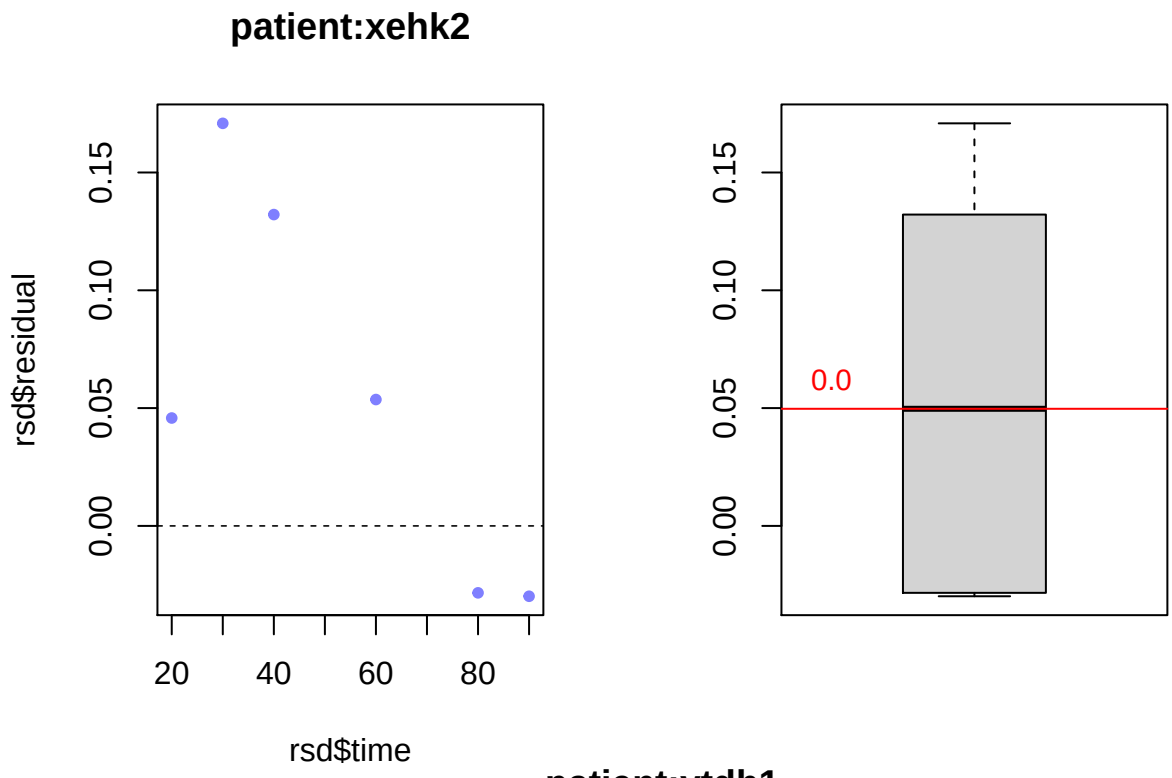

patient:rwrd2
data$aif
3.0
2.0
1.0
0.0
30
40
50
60
70
80
90
data$time
AIF
Poisson

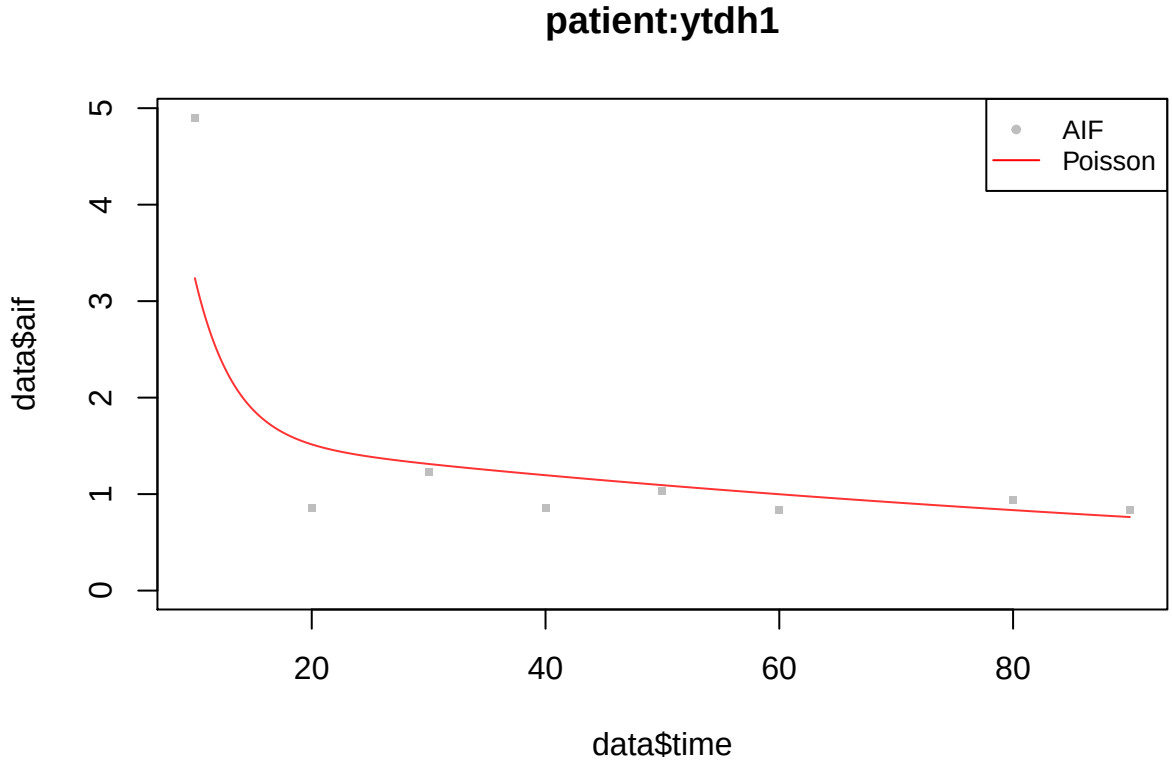

patient:rwrd2
rsd$residual
0.00
0.05
0.10
0.15
0.20
30
50
70
90
rsd$time
0.1

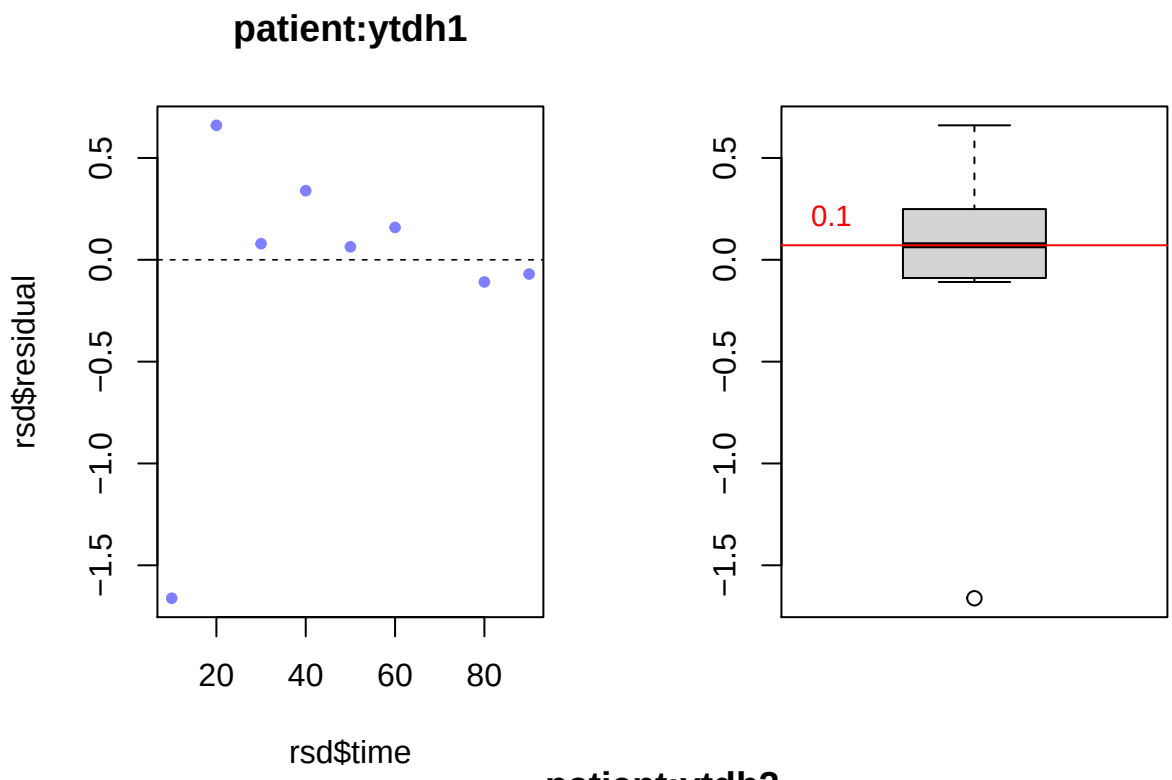

patient:xehk1
data$aif
0
1
2
3
4
AIF
Poisson
20
30
40
50
60
70
80
90
data$time

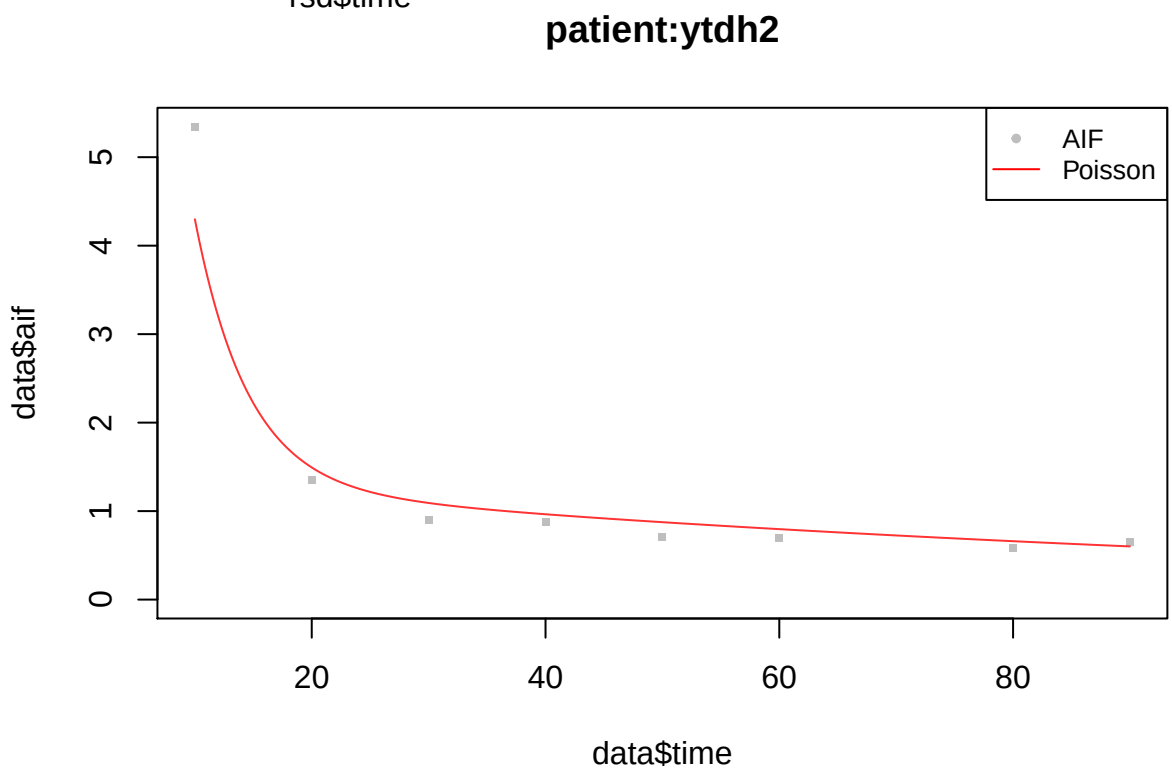

patient:xehk1
rsd$residual
0.10
0.05
0.00
−0.05
20
40
60
80
rsd$time
0.1

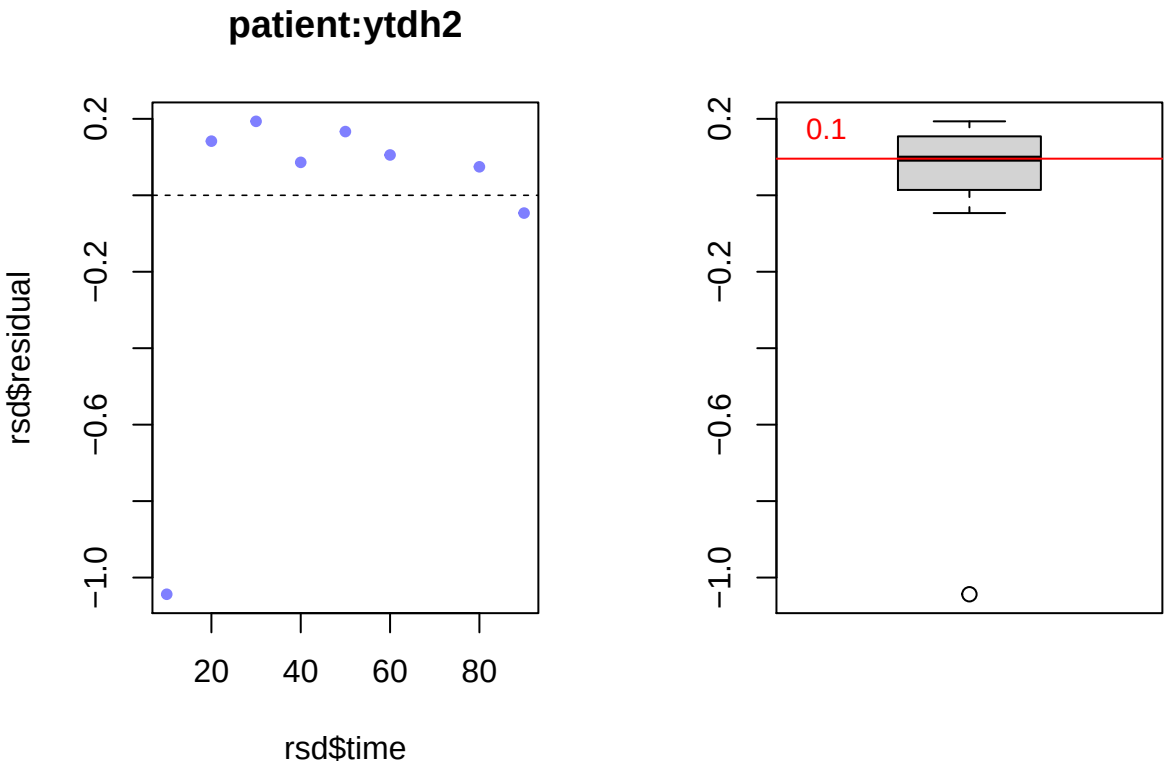

patient:xehk2
AIF
Poisson
data$aif
0
1
2
3
4
20
30
40
50
60
70
80
90
data$time


patient:xehk2
rsd$residual
0.00
0.05
0.10
0.15
20
40
60
80
rsd$time
0.0


patient:ytdh1
data$aif
0
1
2
3
4
5
AIF
Poisson
20
40
60
80
data$time


patient:ytdh1
rsd$residual
rsd$time
0.1


patient:ytdh2
data$aif
data$time
AIF
Poisson


patient:ytdh2
rsd$residual
0.2
−0.2
−0.6
−1.0
20
40
60
80
rsd$time
0.1