g-d-rate

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```
## read data

DF1 = read.table(
  "~/Desktop/MS report/data/Data-selected/10083_IMQUAL_01Oct2021.csv",
  sep = ",", header = TRUE)

DF2 = read.table(
  "~/Desktop/MS report/data/Data-selected/10083_TEXTCAD_01Oct2021.csv",
  sep = ",", header = TRUE)


## extract needed variables for model

d2 = DF1 %>%
  dplyr:: select(contains("SUBJID",ignore.case = TRUE),
                 contains("VISITDTN",ignore.case = TRUE),
                 contains("SLICE",ignore.case = TRUE))

qlf = DF2 %>%
  dplyr:: select(contains("SUBJID",ignore.case = TRUE),
                 contains("VISITDTN",ignore.case = TRUE),
                 contains("REGI",ignore.case = TRUE),
                 contains("QLF",ignore.case = TRUE))

## change variable type

d2$name = as.numeric(factor(d2$SUBJID,
                 levels=unique(d2$SUBJID)))
qlf$name = as.numeric(factor(qlf$SUBJID,
                 levels=unique(qlf$SUBJID)))

d2$SLICE_THICKNESS = as.numeric(d2$SLICE_THICKNESS)
d2$SLICE_SPACING = as.numeric(d2$SLICE_SPACING)
```

```
## Warning: NAs introduced by coercion
```

```
# only use whole lung data for g-d-rate model

qlf = qlf[grep("WHOLE", qlf$REGION), , drop = FALSE]

## change to 2d dim
```

```r
## change name to size due to model requirment

d2$size = d2$SLICE_THICKNESS * d2$SLICE_SPACING
qlf$size = qlf$QLFCAD
```

```r
## change time to day due model requirement

d2$date = as.Date(d2$VISITDTN, format = "%d%b%Y")
d2$date = as.numeric(d2$date)

qlf$date = as.Date(qlf$VISITDTN, format = "%d%b%Y")
qlf$date = as.numeric(qlf$date)
```

```r
## extract needed variables for model

d2 = d2 %>%
  dplyr:: select(contains("name",ignore.case = TRUE),
                 contains("date",ignore.case = TRUE),
                 contains("size",ignore.case = TRUE))

qlf = qlf %>%
  dplyr:: select(contains("name",ignore.case = TRUE),
                 contains("date",ignore.case = TRUE),
                 contains("size",ignore.case = TRUE))
```

```r
## change to dataframe fro model use

d2 = as.data.frame(d2)
qlf = as.data.frame(qlf)

## check and delet missing value

lapply(d2, function(x) {length(which(is.na(x)))})
```

```
## $name
## [1] 0
##
## $date
## [1] 0
##
## $size
## [1] 27
```

```r
lapply(qlf, function(x) {length(which(is.na(x)))})
```

```
## $name
## [1] 0
##
## $date
## [1] 0
```

2

```
##
## $size
## [1] 0
```

```
d2 = na.omit(d2)


## run model

out1 = gdrate(d2, 0.05, FALSE)
out2 = gdrate(qlf, 0.05, FALSE)

out1$models
```

```
##      Group Analyzed                  Type  N Percentage
## 1 excluded       no 2 evals not 20% diff 33         42
## 2 excluded       no            error data 26         33
## 3 excluded      yes               not fit  6          8
## 4 excluded       no           only 1 eval  3          4
## 5 included      yes                    dx  5          6
## 6 included      yes                    gd  3          4
## 7 included      yes                    gx  2          3
```

```
out2$models
```

```
##      Group Analyzed                  Type  N Percentage
## 1 excluded       no 2 evals not 20% diff  9         11
## 2 excluded      yes               not fit 22         27
## 3 included      yes                    dx 21         26
## 4 included      yes                    gd  9         11
## 5 included      yes                 gdphi  1          1
## 6 included      yes                    gx 19         23
```

```
out1$results
```

```
##    name N    type            selectedFit            g            d phi
## 1     1 8 excluded                not fit           NA           NA  NA
## 2    10 3 included                     gd 0.0002638243 2.792243e-04  NA
## 3    11 4 excluded                not fit           NA           NA  NA
## 4    12 3 included                     dx           NA 2.029713e-04  NA
## 5    13 4 included                     gd 0.0003193456 2.368807e-03  NA
## 6    15 3 excluded             error data           NA           NA  NA
## 7    16 3 included                     gd 0.0003420509 2.129747e-03  NA
## 8    17 4 excluded             error data           NA           NA  NA
## 9    18 2 included                     dx           NA 4.070148e-04  NA
## 10   19 5 excluded             error data           NA           NA  NA
## 11    2 2 excluded 2 evals not 20% diff           NA           NA  NA
## 12   20 2 excluded 2 evals not 20% diff           NA           NA  NA
## 13   21 3 excluded             error data           NA           NA  NA
## 14   22 2 excluded 2 evals not 20% diff           NA           NA  NA
## 15   23 2 excluded 2 evals not 20% diff           NA           NA  NA
## 16   24 2 excluded 2 evals not 20% diff           NA           NA  NA
```

```
## 17   25 3 excluded          error data            NA         NA NA
## 18   26 2 excluded 2 evals not 20% diff           NA         NA NA
## 19   27 2 excluded 2 evals not 20% diff           NA         NA NA
## 20   28 2 excluded 2 evals not 20% diff           NA         NA NA
## 21   29 2 excluded 2 evals not 20% diff           NA         NA NA
## 22    3 3 excluded          error data            NA         NA NA
## 23   30 2 excluded 2 evals not 20% diff           NA         NA NA
## 24   31 1 excluded         only 1 eval            NA         NA NA
## 25   32 2 excluded 2 evals not 20% diff           NA         NA NA
## 26   33 2 excluded 2 evals not 20% diff           NA         NA NA
## 27   34 2 excluded 2 evals not 20% diff           NA         NA NA
## 28   35 2 included             gx 0.0037189528    NA         NA NA
## 29   36 3 excluded          error data            NA         NA NA
## 30   37 2 excluded 2 evals not 20% diff           NA         NA NA
## 31   38 2 excluded 2 evals not 20% diff           NA         NA NA
## 32   39 2 excluded 2 evals not 20% diff           NA         NA NA
## 33    4 3 excluded             not fit            NA         NA NA
## 34   40 3 excluded          error data            NA         NA NA
## 35   41 5 excluded          error data            NA         NA NA
## 36   42 2 excluded 2 evals not 20% diff           NA         NA NA
## 37   43 3 excluded          error data            NA         NA NA
## 38   44 5 excluded          error data            NA         NA NA
## 39   45 3 excluded          error data            NA         NA NA
## 40   46 4 excluded          error data            NA         NA NA
## 41   47 2 excluded 2 evals not 20% diff           NA         NA NA
## 42   49 2 excluded 2 evals not 20% diff           NA         NA NA
## 43    5 4 excluded             not fit            NA         NA NA
## 44   50 4 excluded          error data            NA         NA NA
## 45   51 3 excluded          error data            NA         NA NA
## 46   52 1 excluded         only 1 eval            NA         NA NA
## 47   53 3 excluded          error data            NA         NA NA
## 48   54 6 excluded          error data            NA         NA NA
## 49   55 2 excluded 2 evals not 20% diff           NA         NA NA
## 50   56 2 included                  dx            NA 7.558949e-03 NA
## 51   57 4 excluded          error data            NA         NA NA
## 52   58 2 included                  dx            NA 2.688239e-03 NA
## 53   59 2 excluded 2 evals not 20% diff           NA         NA NA
## 54    6 7 excluded          error data            NA         NA NA
## 55   60 1 excluded         only 1 eval            NA         NA NA
## 56   61 2 excluded 2 evals not 20% diff           NA         NA NA
## 57   62 5 excluded          error data            NA         NA NA
## 58   63 2 excluded 2 evals not 20% diff           NA         NA NA
## 59   64 2 excluded 2 evals not 20% diff           NA         NA NA
## 60   65 2 excluded 2 evals not 20% diff           NA         NA NA
## 61   66 6 excluded             not fit            NA         NA NA
## 62   67 2 excluded 2 evals not 20% diff           NA         NA NA
## 63   68 3 excluded          error data            NA         NA NA
## 64   69 2 excluded 2 evals not 20% diff           NA         NA NA
## 65    7 2 excluded 2 evals not 20% diff           NA         NA NA
## 66   70 2 excluded 2 evals not 20% diff           NA         NA NA
## 67   71 3 excluded          error data            NA         NA NA
## 68   72 3 excluded          error data            NA         NA NA
## 69   73 3 excluded          error data            NA         NA NA
## 70   74 2 excluded 2 evals not 20% diff           NA         NA NA
```

```
## 71   75 4 excluded             error data          NA          NA NA
## 72   76 2 excluded 2 evals not 20% diff            NA          NA NA
## 73   78 5 excluded             error data          NA          NA NA
## 74   79 4 excluded                  not fit        NA          NA NA
## 75    8 2 excluded 2 evals not 20% diff            NA          NA NA
## 76   80 2 included              gx 0.0041707573          NA NA
## 77   81 2 excluded 2 evals not 20% diff            NA          NA NA
## 78    9 8 included                  dx        NA 9.144017e-05 NA
```

out2$results

```
##     name N    type          selectedFit          g            d phi
## 1      1 8 included                  dx          NA 4.250205e-05  NA
## 2     10 3 excluded             not fit          NA           NA  NA
## 3     11 4 excluded             not fit          NA           NA  NA
## 4     12 3 included                  gx 3.695297e-04          NA  NA
## 5     13 4 excluded             not fit          NA           NA  NA
## 6     14 7 included                  gx 4.709383e-04          NA  NA
## 7     15 3 excluded             not fit          NA           NA  NA
## 8     16 3 included                  gd 3.472976e-04 1.538204e-03  NA
## 9     17 4 included                  gd 1.134232e-03 6.423720e-03  NA
## 10    18 2 included                  gx 1.129606e-04          NA  NA
## 11    19 5 included                  gx 4.696639e-03          NA  NA
## 12     2 2 excluded 2 evals not 20% diff          NA           NA  NA
## 13    20 2 included                  gx 2.064491e-03          NA  NA
## 14    21 3 excluded             not fit          NA           NA  NA
## 15    22 2 included                  dx          NA 2.887504e-03  NA
## 16    23 3 included                  gx 4.318699e-03          NA  NA
## 17    24 2 included                  gx 1.821757e-03          NA  NA
## 18    25 3 excluded             not fit          NA           NA  NA
## 19    26 2 included                  gx 7.679729e-04          NA  NA
## 20    27 2 included                  gx 2.359925e-03          NA  NA
## 21    28 2 excluded 2 evals not 20% diff          NA           NA  NA
## 22    29 2 included                  gx 4.853069e-03          NA  NA
## 23     3 3 excluded             not fit          NA           NA  NA
## 24    30 2 included                  dx          NA 2.287351e-03  NA
## 25    31 2 included                  gx 2.121368e-03          NA  NA
## 26    32 2 included                  dx          NA 2.871167e-03  NA
## 27    33 2 included                  dx          NA 2.410754e-03  NA
## 28    34 2 included                  dx          NA 3.905363e-03  NA
## 29    35 2 excluded 2 evals not 20% diff          NA           NA  NA
## 30    36 3 excluded             not fit          NA           NA  NA
## 31    37 2 included                  dx          NA 2.608027e-03  NA
## 32    38 2 included                  dx          NA 1.507024e-03  NA
## 33    39 2 excluded 2 evals not 20% diff          NA           NA  NA
## 34     4 3 included                  dx          NA 6.964839e-05  NA
## 35    40 3 included                  gd 1.718128e-03 2.571567e-03  NA
## 36    41 5 excluded             not fit          NA           NA  NA
## 37    42 2 excluded 2 evals not 20% diff          NA           NA  NA
## 38    43 3 included                  gd 1.137679e-03 2.858925e-03  NA
## 39    44 5 included                  gd 4.289819e-04 1.233418e-02  NA
## 40    45 3 excluded             not fit          NA           NA  NA
## 41    46 4 excluded             not fit          NA           NA  NA
## 42    47 2 included                  gx 9.967953e-03          NA  NA
```

```
## 43    48 5 excluded               not fit        NA          NA        NA
## 44    49 2 included                    dx         NA 1.508916e-03       NA
## 45     5 4 included                    gx 2.809419e-04          NA       NA
## 46    50 4 included                    dx         NA 6.174451e-04       NA
## 47    51 3 included                    gd 3.268313e-04 2.942957e-03       NA
## 48    52 2 included                    dx         NA 2.653565e-04       NA
## 49    53 3 excluded               not fit        NA          NA        NA
## 50    54 7 excluded               not fit        NA          NA        NA
## 51    55 2 included                    dx         NA 3.365417e-04       NA
## 52    56 2 excluded 2 evals not 20% diff        NA          NA        NA
## 53    57 4 included                    gx 2.337276e-04          NA       NA
## 54    58 2 included                    dx         NA 5.103204e-03       NA
## 55    59 2 included                    dx         NA 3.534236e-03       NA
## 56     6 7 included                    gd 5.119076e-05 4.800404e-03       NA
## 57    60 2 included                    gx 9.608521e-04          NA       NA
## 58    61 2 excluded               not fit        NA          NA        NA
## 59    62 5 excluded               not fit        NA          NA        NA
## 60    63 2 included                    gx 2.674736e-03          NA       NA
## 61    64 2 included                    dx         NA 5.694445e-04       NA
## 62    65 2 included                    dx         NA 3.970820e-04       NA
## 63    66 6 included                  gdphi 3.958584e-04 5.663152e-03 0.6397329
## 64    67 2 included                    dx         NA 2.361476e-03       NA
## 65    68 4 excluded               not fit        NA          NA        NA
## 66    69 2 excluded 2 evals not 20% diff        NA          NA        NA
## 67     7 2 excluded 2 evals not 20% diff        NA          NA        NA
## 68    70 3 included                    gd 7.218299e-04 1.139716e-03       NA
## 69    71 3 included                    gd 7.128279e-04 1.883934e-03       NA
## 70    72 4 excluded               not fit        NA          NA        NA
## 71    73 3 excluded               not fit        NA          NA        NA
## 72    74 2 included                    dx         NA 5.929183e-04       NA
## 73    75 4 excluded               not fit        NA          NA        NA
## 74    76 2 excluded 2 evals not 20% diff        NA          NA        NA
## 75    77 6 excluded               not fit        NA          NA        NA
## 76    78 5 included                    gx 1.787813e-04          NA       NA
## 77    79 3 excluded               not fit        NA          NA        NA
## 78     8 2 included                    dx         NA 5.316098e-04       NA
## 79    80 2 included                    dx         NA 4.772922e-03       NA
## 80    81 2 included                    gx 4.927585e-04          NA       NA
## 81     9 9 included                    gx 4.825402e-04          NA       NA
```
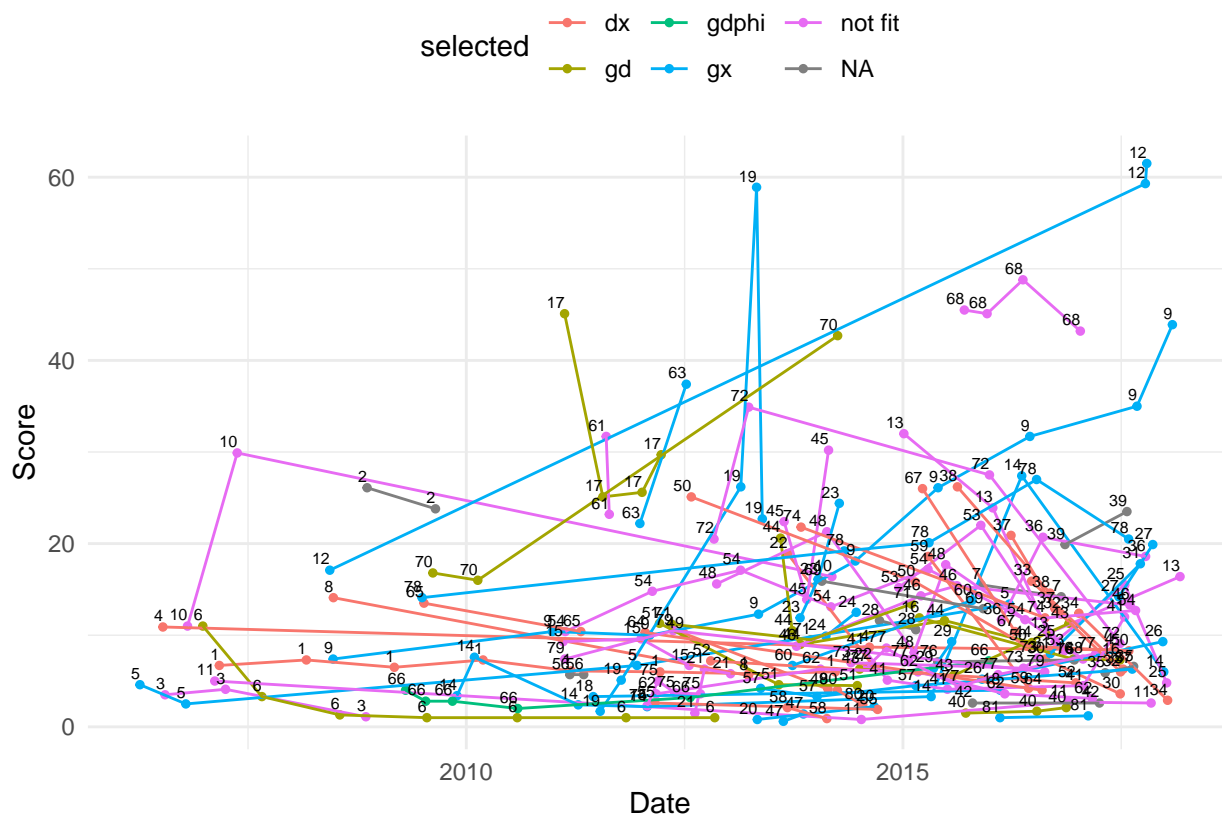
```r
# Define a function to generate the plot
plot_data = function(data) {

  # Create a new plot
  plot = ggplot(data, aes(x = date, y = size, group = name, color = selected)) +
    geom_point(size = 1) +
    geom_line() +
    labs(x = "Date", y = "Score") +
    theme_minimal() +
    theme(legend.position = "top")

  # Add text labels for name on each line
  plot = plot + geom_text(aes(label = name), vjust = -0.5, hjust = 1,
                          size = 2, color = "black")
```

```
  return(plot)
}
```

```
##plot results

cols_to_select = c("type", "selected", "name")

gd1 = as.data.frame(out1$allest[cols_to_select])
gd2 = as.data.frame(out2$allest[cols_to_select])

# delete duplicated rows
gd1 = gd1[!duplicated(gd1), ]
gd2 = gd2[!duplicated(gd2), ]


d2_2 = merge(d2, gd1, by = "name", all = TRUE)
qlf_2 = merge(qlf, gd2, by = "name", all = TRUE)


d2_2$date = as.Date(d2_2$date, origin = "1970-01-01")
qlf_2$date = as.Date(qlf_2$date, origin = "1970-01-01")

plot_data(d2_2)
```



```
plot_data(qlf_2)
```

combined data which now contains treatments

```r
## read data

DF1 = read.table(
  "~/Desktop/MS report/data/Data-selected/10083_IMQUAL_01Oct2021.csv",
  sep = ",", header = TRUE)

DF2 = read.table(
  "~/Desktop/MS report/data/Data-selected/10083_TEXTCAD_01Oct2021.csv",
  sep = ",", header = TRUE)

Treat = read.table(
  "~/Desktop/MS report/data/Data-selected 2/IIMQILD_221104_Box.csv",
  sep = ",", header = TRUE)

## change column name for merge
colnames(Treat)[which(names(Treat) == "Patient_ID")] <- "SUBJID"


##merge
DF1_merge = merge(DF1, Treat, by = 'SUBJID', all = TRUE)
DF2_merge = merge(DF2, Treat, by = 'SUBJID', all = TRUE)


##extract needed variables
```

```r
d2 = DF1_merge %>%
  dplyr:: select(Age,
                 V1_WL_QLF,
                 V1_WL_QILD,
                 contains("SUBJID",ignore.case = FALSE),
                 contains("VISITDTN",ignore.case = FALSE),
                 contains("Sex",ignore.case = FALSE),
                 contains("V1_CTdate",ignore.case = FALSE),
                 contains("V1V2",ignore.case = FALSE),
                 contains("SLICE",ignore.case = FALSE))

qlf = DF2_merge %>%
  dplyr:: select(Age,
                 V1_WL_QLF,
                 V1_WL_QILD,
                 QLFCAD,
                 contains("SUBJID",ignore.case = FALSE),
                 contains("VISITDTN",ignore.case = FALSE),
                 contains("Sex",ignore.case = FALSE),
                 contains("V1_CTdate",ignore.case = FALSE),
                 contains("V1V2",ignore.case = FALSE),
                 contains("REGI",ignore.case = FALSE))

## only need whole lung data
qlf = qlf[grep("WHOLE", qlf$REGION), , drop = FALSE]


## change variable type

d2$name = as.numeric(factor(d2$SUBJID,
                 levels=unique(d2$SUBJID)))
qlf$name = as.numeric(factor(qlf$SUBJID,
                 levels=unique(qlf$SUBJID)))

d2$SLICE_THICKNESS = as.numeric(d2$SLICE_THICKNESS)
d2$SLICE_SPACING = as.numeric(d2$SLICE_SPACING)
```

Warning: NAs introduced by coercion

```r
d2$size = d2$SLICE_THICKNESS * d2$SLICE_SPACING

colnames(qlf)[which(names(qlf) == "QLFCAD")] = "size"


## check and delet missing value

#lapply(d2, function(x) {length(which(is.na(x)))})
#lapply(qlf, function(x) {length(which(is.na(x)))})
#d2 = na.omit(d2)


## change time to day due model requirement
```

```
d2$date = as.Date(d2$VISITDTN, format = "%d%b%Y")
d2$date = as.numeric(d2$date)

qlf$date = as.Date(qlf$VISITDTN, format = "%d%b%Y")
qlf$date = as.numeric(qlf$date)


as.data.frame(qlf)
```

```
##       Age V1_WL_QLF V1_WL_QILD size          SUBJID   VISITDTN Sex V1_CTdate
## 3      54       6.7       18.6  7.3 10083_SNUBH_P01 03MAR2008    2   5-Mar-07
## 18     54       6.7       18.6  6.5 10083_SNUBH_P01 06MAR2009    2   5-Mar-07
## 29     54       6.7       18.6  6.7 10083_SNUBH_P01 05MAR2007    2   5-Mar-07
## 35     54       6.7       18.6  6.0 10083_SNUBH_P01 21MAR2012    2   5-Mar-07
## 44     54       6.7       18.6  5.8 10083_SNUBH_P01 27MAR2013    2   5-Mar-07
## 51     54       6.7       18.6  6.0 10083_SNUBH_P01 24MAR2014    2   5-Mar-07
## 55     54       6.7       18.6  7.3 10083_SNUBH_P01 12MAR2010    2   5-Mar-07
## 66     54       6.7       18.6  6.1 10083_SNUBH_P01 16MAR2011    2   5-Mar-07
## 76     68      26.1       48.3 26.1 10083_SNUBH_P02 12NOV2008    2  12-Nov-08
## 79     68      26.1       48.3 23.8 10083_SNUBH_P02 25AUG2009    2  12-Nov-08
## 104    25       3.5        8.0  1.1 10083_SNUBH_P03 07NOV2008    2  21-Jul-06
## 107    25       3.5        8.0  3.5 10083_SNUBH_P03 21JUL2006    2  21-Jul-06
## 111    25       3.5        8.0  4.1 10083_SNUBH_P03 31MAR2007    2  21-Jul-06
## 119    64      10.9       24.1  8.7 10083_SNUBH_P04 14AUG2014    2  12-Jul-06
## 123    64      10.9       24.1  8.4 10083_SNUBH_P04 31MAY2017    2  12-Jul-06
## 127    64      10.9       24.1 10.9 10083_SNUBH_P04 12JUL2006    2  12-Jul-06
## 146    57       4.6       12.5  4.6 10083_SNUBH_P05 07APR2006    1   7-Apr-06
## 155    57       4.6       12.5 13.4 10083_SNUBH_P05 21MAR2016    1   7-Apr-06
## 166    57       4.6       12.5  2.5 10083_SNUBH_P05 16OCT2006    1   7-Apr-06
## 176    57       4.6       12.5  6.7 10083_SNUBH_P05 16DEC2011    1   7-Apr-06
## 183    49      11.0       20.2 11.0 10083_SNUBH_P06 26DEC2006    1  26-Dec-06
## 192    49      11.0       20.2  1.0 10083_SNUBH_P06 20JUL2009    1  26-Dec-06
## 203    49      11.0       20.2  1.0 10083_SNUBH_P06 02AUG2010    1  26-Dec-06
## 215    49      11.0       20.2  1.0 10083_SNUBH_P06 31OCT2011    1  26-Dec-06
## 223    49      11.0       20.2  1.0 10083_SNUBH_P06 05NOV2012    1  26-Dec-06
## 237    49      11.0       20.2  1.3 10083_SNUBH_P06 21JUL2008    1  26-Dec-06
## 242    49      11.0       20.2  3.3 10083_SNUBH_P06 30AUG2007    1  26-Dec-06
## 246    48      15.5       36.8 14.2 10083_SNUBH_P07 24OCT2016    2  24-Nov-15
## 257    48      15.5       36.8 15.5 10083_SNUBH_P07 24NOV2015    2  24-Nov-15
## 265    63      14.1       50.5 14.1 10083_SNUBH_P08 24JUN2008    2  24-Jun-08
## 268    63      14.1       50.5  5.6 10083_SNUBH_P08 26MAR2013    2  24-Jun-08
## 291    59       7.4       21.1 12.3 10083_SNUBH_P09 07MAY2013    2  23-Jun-08
## 300    59       7.4       21.1 10.0 10083_SNUBH_P09 07FEB2012    2  23-Jun-08
## 309    59       7.4       21.1  7.4 10083_SNUBH_P09 23JUN2008    2  23-Jun-08
## 311    59       7.4       21.1 10.4 10083_SNUBH_P09 27DEC2010    2  23-Jun-08
## 321    59       7.4       21.1 31.7 10083_SNUBH_P09 15JUN2016    2  23-Jun-08
## 331    59       7.4       21.1 35.0 10083_SNUBH_P09 06SEP2017    2  23-Jun-08
## 339    59       7.4       21.1 43.9 10083_SNUBH_P09 01FEB2018    2  23-Jun-08
## 347    59       7.4       21.1 18.1 10083_SNUBH_P09 16JUN2014    2  23-Jun-08
## 352    59       7.4       21.1 26.1 10083_SNUBH_P09 28MAY2015    2  23-Jun-08
## 367    58      11.0       29.4 16.4 10083_SNUBH_P10 10MAR2014    2  23-Oct-06
## 369    58      11.0       29.4 29.9 10083_SNUBH_P10 19MAY2007    2  23-Oct-06
## 376    58      11.0       29.4 11.0 10083_SNUBH_P10 23OCT2006    2  23-Oct-06
```

```
## 394   34     5.0      19.2   5.0 10083_SNUBH_P11 14FEB2007   2 14-Feb-07
## 400   34     5.0      19.2   2.6 10083_SNUBH_P11 04NOV2017   2 14-Feb-07
## 413   34     5.0      19.2   0.8 10083_SNUBH_P11 11JUL2014   2 14-Feb-07
## 423   34     5.0      19.2   2.7 10083_SNUBH_P11 22NOV2016   2 14-Feb-07
## 427   69    17.1      46.8  17.1 10083_SNUBH_P12 09JUN2008   2  9-Jun-08
## 443   69    17.1      46.8  61.5 10083_SNUBH_P12 17OCT2017   2  9-Jun-08
## 446   69    17.1      46.8  59.3 10083_SNUBH_P12 11OCT2017   2  9-Jun-08
## 453   39    32.0      58.9  32.0 10083_SNUBH_P13 05JAN2015   2  5-Jan-15
## 466   39    32.0      58.9  10.2 10083_SNUBH_P13 31AUG2016   2  5-Jan-15
## 471   39    32.0      58.9  23.9 10083_SNUBH_P13 12JAN2016   2  5-Jan-15
## 482   39    32.0      58.9  16.4 10083_SNUBH_P13 05MAR2018   2  5-Jan-15
## 489   46     3.4      28.5   3.4 10083_SNUBH_P14 23NOV2009   2 23-Nov-09
## 497   46     3.4      28.5   2.2 10083_SNUBH_P14 27JAN2012   2 23-Nov-09
## 498   46     3.4      28.5   7.6 10083_SNUBH_P14 04FEB2010   2 23-Nov-09
## 502   46     3.4      28.5   2.4 10083_SNUBH_P14 14APR2011   2 23-Nov-09
## 516   46     3.4      28.5  27.4 10083_SNUBH_P14 12MAY2016   2 23-Nov-09
## 530   46     3.4      28.5   6.0 10083_SNUBH_P14 27DEC2017   2 23-Nov-09
## 537   46     3.4      28.5   3.3 10083_SNUBH_P14 29APR2015   2 23-Nov-09
## 554   57     9.3      28.5   9.3 10083_SNUBH_P15 10FEB2011   1 10-Feb-11
## 559   57     9.3      28.5   9.6 10083_SNUBH_P15 02JAN2012   1 10-Feb-11
## 575   57     9.3      28.5   6.7 10083_SNUBH_P15 21JUL2012   1 10-Feb-11
## 580   61    11.9      35.1  11.9 10083_SNUBH_P16 11MAR2015   2 11-Mar-15
## 586   61    11.9      35.1   7.4 10083_SNUBH_P16 14DEC2016   2 11-Mar-15
## 590   61    11.9      35.1   7.3 10083_SNUBH_P16 27JUN2017   2 11-Mar-15
## 608   52    45.1      75.1  25.6 10083_SNUBH_P17 06JAN2012   2 16-Feb-11
## 612   52    45.1      75.1  25.1 10083_SNUBH_P17 26JUL2011   2 16-Feb-11
## 617   52    45.1      75.1  29.7 10083_SNUBH_P17 26MAR2012   2 16-Feb-11
## 629   52    45.1      75.1  45.1 10083_SNUBH_P17 16FEB2011   2 16-Feb-11
## 640   56     3.3       9.4   4.0 10083_SNUBH_P18 12FEB2016   1 16-Jun-11
## 647   56     3.3       9.4   3.3 10083_SNUBH_P18 16JUN2011   1 16-Jun-11
## 661   42     1.7      16.9   1.7 10083_SNUBH_P19 15JUL2011   2 15-Jul-11
## 666   42     1.7      16.9   5.1 10083_SNUBH_P19 11OCT2011   2 15-Jul-11
## 681   42     1.7      16.9  22.7 10083_SNUBH_P19 23MAY2013   2 15-Jul-11
## 692   42     1.7      16.9  26.2 10083_SNUBH_P19 22FEB2013   2 15-Jul-11
## 701   42     1.7      16.9  58.9 10083_SNUBH_P19 29APR2013   2 15-Jul-11
## 705   49     0.8       9.9   0.8 10083_SNUBH_P20 02MAY2013   2  2-May-13
## 712   49     0.8       9.9   2.2 10083_SNUBH_P20 03SEP2014   2  2-May-13
## 725   60     1.5       9.6   5.8 10083_SNUBH_P21 10JAN2013   2 14-Aug-12
## 732   60     1.5       9.6   1.5 10083_SNUBH_P21 14AUG2012   2 14-Aug-12
## 747   60     1.5       9.6   6.3 10083_SNUBH_P21 23SEP2012   2 14-Aug-12
## 751   76    18.9      56.0  18.9 10083_SNUBH_P22 06SEP2013   2  6-Sep-13
## 765   76    18.9      56.0   6.8 10083_SNUBH_P22 25AUG2014   2  6-Sep-13
## 770   55    11.9      35.0  24.4 10083_SNUBH_P23 10APR2014   2 28-Oct-13
## 774   55    11.9      35.0  16.1 10083_SNUBH_P23 11JAN2014   2 28-Oct-13
## 776   55    11.9      35.0  11.9 10083_SNUBH_P23 28OCT2013   2 28-Oct-13
## 801   32     9.9      17.9  12.5 10083_SNUBH_P24 20JUN2014   2 13-Feb-14
## 810   32     9.9      17.9   9.9 10083_SNUBH_P24 13FEB2014   2 13-Feb-14
## 823   48     9.3      27.1  15.5 10083_SNUBH_P25 17JUL2017   2 29-Sep-16
## 832   48     9.3      27.1   4.8 10083_SNUBH_P25 08JAN2018   2 29-Sep-16
## 836   48     9.3      27.1   9.3 10083_SNUBH_P25 29SEP2016   2 29-Sep-16
## 848   41     5.2      17.9   9.3 10083_SNUBH_P26 23DEC2017   1 28-Nov-15
## 852   41     5.2      17.9   5.2 10083_SNUBH_P26 28NOV2015   1 28-Nov-15
## 860   57    14.2      40.5  14.2 10083_SNUBH_P27 22JUN2017   1 22-Jun-17
## 872   57    14.2      40.5  19.9 10083_SNUBH_P27 11NOV2017   1 22-Jun-17
```

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## 877   71    12.4      32.9 11.6 10083_SNUBH_P28 25SEP2014   1 25-Sep-14
## 884   71    12.4      32.9 10.6 10083_SNUBH_P28 24FEB2015   1 25-Sep-14
## 896   42     6.4      20.0  9.3 10083_SNUBH_P29 24JUL2015   2  9-May-15
## 908   42     6.4      20.0  6.4 10083_SNUBH_P29 09MAY2015   2  9-May-15
## 911   35     7.4      17.0  7.4 10083_SNUBH_P30 18AUG2016   2 18-Aug-16
## 920   35     7.4      17.0  3.6 10083_SNUBH_P30 28JUN2017   2 18-Aug-16
## 936   37     8.0      21.7 17.8 10083_SNUBH_P31 20SEP2017   1  9-Sep-16
## 942   37     8.0      21.7  8.0 10083_SNUBH_P31 09SEP2016   1  9-Sep-16
## 956   44    12.3      30.4  6.0 10083_SNUBH_P32 29JUN2017   2 23-Oct-16
## 959   44    12.3      30.4 12.3 10083_SNUBH_P32 23OCT2016   2 23-Oct-16
## 976   68    15.9      40.9 15.9 10083_SNUBH_P33 22JUN2016   2 22-Jun-16
## 979   68    15.9      40.9  6.3 10083_SNUBH_P33 10JUL2017   2 22-Jun-16
## 994   59    12.4      48.8  2.9 10083_SNUBH_P34 12JAN2018   2  6-Jan-17
## 997   59    12.4      48.8 12.4 10083_SNUBH_P34 06JAN2017   2  6-Jan-17
## 1013  52     5.9      21.8  5.9 10083_SNUH_P01 26APR2017   2 26-Apr-17
## 1015  52     5.9      21.8  6.6 10083_SNUH_P01 23AUG2017   2 26-Apr-17
## 1028  57    11.7      22.4 20.7 10083_SNUH_P02 09AUG2016   1 17-Feb-16
## 1031  57    11.7      22.4 18.6 10083_SNUH_P02 12OCT2017   1 17-Feb-16
## 1040  57    11.7      22.4 11.7 10083_SNUH_P02 17FEB2016   1 17-Feb-16
## 1047  71    20.9      50.2 20.9 10083_SNUH_P03 28MAR2016   1 28-Mar-16
## 1059  71    20.9      50.2 12.9 10083_SNUH_P03 28SEP2016   1 28-Mar-16
## 1065  46    26.2      50.2 26.2 10083_SNUH_P04 17AUG2015   2 17-Aug-15
## 1080  46    26.2      50.2 14.6 10083_SNUH_P04 07SEP2016   2 17-Aug-15
## 1093  52    19.9      45.2 19.9 10083_SNUH_P05 09NOV2016   2  9-Nov-16
## 1096  52    19.9      45.2 23.5 10083_SNUH_P05 26JUL2017   2  9-Nov-16
## 1110  51     1.5      19.3  1.7 10083_SNUH_P06 14JUL2016   2 21-Sep-15
## 1116  51     1.5      19.3  2.1 10083_SNUH_P06 14NOV2016   2 21-Sep-15
## 1121  51     1.5      19.3  1.5 10083_SNUH_P06 21SEP2015   2 21-Sep-15
## 1139  61     8.4      21.8  4.5 10083_SNUH_P07 25JAN2017   1 25-Jul-14
## 1146  61     8.4      21.8  4.1 10083_SNUH_P07 06JUL2015   1 25-Jul-14
## 1149  61     8.4      21.8  8.4 10083_SNUH_P07 25JUL2014   1 25-Jul-14
## 1161  61     8.4      21.8  5.1 10083_SNUH_P07 28OCT2014   1 25-Jul-14
## 1166  61     8.4      21.8 12.0 10083_SNUH_P07 16JUL2017   1 25-Jul-14
## 1177  34     2.6      26.7  2.6 10083_SNUH_P08 02APR2017   2 19-Oct-15
## 1182  34     2.6      26.7  2.6 10083_SNUH_P08 19OCT2015   2 19-Oct-15
## 1195  75     7.7      34.0  5.6 10083_SNUH_P09 31JUL2015   2  4-Jul-14
## 1201  75     7.7      34.0  6.3 10083_SNUH_P09 04JUL2014   2  4-Jul-14
## 1211  75     7.7      34.0 11.3 10083_SNUH_P09 26NOV2016   2  4-Jul-14
## 1220  57    20.6      43.9 10.5 10083_SNUH_P10 25SEP2013   2  7-Aug-13
## 1233  57    20.6      43.9  9.0 10083_SNUH_P10 29OCT2013   2  7-Aug-13
## 1243  57    20.6      43.9 20.6 10083_SNUH_P10 07AUG2013   2  7-Aug-13
## 1246  57    20.6      43.9 11.6 10083_SNUH_P10 24JUN2015   2  7-Aug-13
## 1249  57    20.6      43.9  9.2 10083_SNUH_P10 23JUN2016   2  7-Aug-13
## 1277  53    22.4      57.5 30.2 10083_SNUH_P11 24FEB2014   2 22-Aug-13
## 1280  53    22.4      57.5 13.9 10083_SNUH_P11 25NOV2013   2 22-Aug-13
## 1283  53    22.4      57.5 22.4 10083_SNUH_P11 22AUG2013   2 22-Aug-13
## 1293  53     8.8      22.4 15.4 10083_SNUH_P12 15AUG2015   1 13-Oct-13
## 1299  53     8.8      22.4 13.3 10083_SNUH_P12 07AUG2017   1 13-Oct-13
## 1317  53     8.8      22.4  8.8 10083_SNUH_P12 13OCT2013   1 13-Oct-13
## 1321  53     8.8      22.4 14.3 10083_SNUH_P12 17MAR2015   1 13-Oct-13
## 1332  48     0.6       4.3  1.4 10083_SNUH_P13 11NOV2013   2 19-Aug-13
## 1336  48     0.6       4.3  0.6 10083_SNUH_P13 19AUG2013   2 19-Aug-13
## 1353  41    15.6      32.7 21.3 10083_SNUH_P14 17FEB2014   2 13-Nov-12
## 1356  41    15.6      32.7  8.1 10083_SNUH_P14 17FEB2015   2 13-Nov-12
```

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## 1365   41    15.6      32.7  15.6   10083_SNUH_P14 13NOV2012   2 13-Nov-12
## 1366   41    15.6      32.7   7.4   10083_SNUH_P14 23JAN2017   2 13-Nov-12
## 1371   41    15.6      32.7  17.7   10083_SNUH_P14 29JUN2015   2 13-Nov-12
## 1400   71    10.2      35.7   4.1   10083_SNUH_P15 22FEB2014   2 29-Jun-12
## 1401   71    10.2      35.7  10.2   10083_SNUH_P15 29JUN2012   2 29-Jun-12
## 1411   73    22.4      43.6   8.8   10083_SNUH_P16 03JUN2016   2 30-Jul-12
## 1414   73    22.4      43.6   8.3   10083_SNUH_P16 03AUG2017   2 30-Jul-12
## 1434   73    22.4      43.6  25.1   10083_SNUH_P16 30JUL2012   2 30-Jul-12
## 1436   73    22.4      43.6  15.8   10083_SNUH_P16 22FEB2015   2 30-Jul-12
## 1444   52    15.7      47.9  11.3   10083_SNUH_P17 19MAR2012   2 19-Mar-12
## 1461   52    15.7      47.9   4.6   10083_SNUH_P17 31JUL2013   2 19-Mar-12
## 1464   52    15.7      47.9   4.5   10083_SNUH_P17 24JUN2014   2 19-Mar-12
## 1479   52     7.2      14.6   4.8   10083_SNUH_P18 24DEC2016   2 19-Oct-12
## 1484   52     7.2      14.6   7.2   10083_SNUH_P18 19OCT2012   2 19-Oct-12
## 1493   58    18.2      49.8   8.3   10083_SNUH_P19 06NOV2016   2 15-Dec-14
## 1501   58    18.2      49.8  15.2   10083_SNUH_P19 15DEC2014   2 15-Dec-14
## 1507   58    18.2      49.8  22.0   10083_SNUH_P19 23NOV2015   2 15-Dec-14
## 1513   49    10.4      25.5  10.4   10083_SNUH_P20 19FEB2011   1 19-Feb-11
## 1536   49    10.4      25.5  17.2   10083_SNUH_P20 16APR2015   1 19-Feb-11
## 1547   49    10.4      25.5  11.7   10083_SNUH_P20 26MAY2016   1 19-Feb-11
## 1550   49    10.4      25.5  12.7   10083_SNUH_P20 31AUG2017   1 19-Feb-11
## 1558   49    10.4      25.5  17.1   10083_SNUH_P20 21FEB2013   1 19-Feb-11
## 1566   49    10.4      25.5  13.1   10083_SNUH_P20 06MAR2014   1 19-Feb-11
## 1574   49    10.4      25.5  14.8   10083_SNUH_P20 18FEB2012   1 19-Feb-11
## 1576   43     2.6      21.1   1.9   10083_SNUH_P21 17SEP2014   2 29-Feb-12
## 1588   43     2.6      21.1   2.6   10083_SNUH_P21 29FEB2012   2 29-Feb-12
## 1597   28     5.7      12.5   5.7   10083_SNUH_P22 10MAR2011   1 10-Mar-11
## 1608   28     5.7      12.5   5.7   10083_SNUH_P22 07MAY2011   1 10-Mar-11
## 1624   39     4.2      15.4   6.3   10083_SNUH_P23 17AUG2017   2 16-May-13
## 1633   39     4.2      15.4   4.5   10083_SNUH_P23 24FEB2015   2 16-May-13
## 1636   39     4.2      15.4   4.2   10083_SNUH_P23 16MAY2013   2 16-May-13
## 1644   39     4.2      15.4   3.3   10083_SNUH_P23 07JAN2014   2 16-May-13
## 1657   NA      NA        NA   2.1   10083_SNUH_P24 05SEP2013  NA      <NA>
## 1661   NA      NA        NA   0.9   10083_SNUH_P24 17FEB2014  NA      <NA>
## 1668   66    18.6      37.4  18.6   10083_SNUH_P25 17APR2015   1 17-Apr-15
## 1680   66    18.6      37.4   4.2   10083_SNUH_P25 10JUN2016   1 17-Apr-15
## 1688   69     6.7      24.3   6.7   10083_SNUH_P26 26SEP2013   2 26-Sep-13
## 1695   69     6.7      24.3  13.8   10083_SNUH_P26 17OCT2015   2 26-Sep-13
## 1708   63    34.4      55.8  31.7   10083_SNUH_P27 09AUG2011   1  9-Aug-11
## 1712   63    34.4      55.8  23.2   10083_SNUH_P27 22AUG2011   1  9-Aug-11
## 1724   33     3.6      19.0   3.6   10083_SNUH_P28 05MAR2012   2  5-Mar-12
## 1736   33     3.6      19.0   6.3   10083_SNUH_P28 21JAN2014   2  5-Mar-12
## 1739   33     3.6      19.0   6.0   10083_SNUH_P28 05MAR2015   2  5-Mar-12
## 1747   33     3.6      19.0   3.6   10083_SNUH_P28 02MAR2016   2  5-Mar-12
## 1761   33     3.6      19.0   3.1   10083_SNUH_P28 03MAR2017   2  5-Mar-12
## 1766   40    22.2      56.5  22.2   10083_SNUH_P29 28DEC2011   2 28-Dec-11
## 1778   40    22.2      56.5  37.4   10083_SNUH_P29 09JUL2012   2 28-Dec-11
## 1788   52    10.3      24.8  10.3   10083_SNUH_P30 19JAN2012   2 19-Jan-12
## 1794   52    10.3      24.8   4.0   10083_SNUH_P30 05AUG2016   2 19-Jan-12
## 1806   56    17.6      48.8  13.5   10083_SNUH_P31 08JUL2009   1  8-Jul-09
## 1816   56    17.6      48.8  10.4   10083_SNUH_P31 25APR2011   1  8-Jul-09
## 1823   63     4.0      10.9   4.0   10083_SNUH_P32 22APR2009   2 22-Apr-09
## 1830   63     4.0      10.9   2.8   10083_SNUH_P32 15JUL2009   2 22-Apr-09
## 1840   63     4.0      10.9   2.8   10083_SNUH_P32 04NOV2009   2 22-Apr-09
```

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## 1847 63    4.0    10.9  2.0  10083_SNUH_P32 04AUG2010  2 22-Apr-09
## 1863 63    4.0    10.9  3.2  10083_SNUH_P32 25JUL2012  2 22-Apr-09
## 1871 63    4.0    10.9  7.2  10083_SNUH_P32 26DEC2015  2 22-Apr-09
## 1874 65   26.0    44.2 26.0  10083_SNUH_P33 24MAR2015  2 24-Mar-15
## 1885 65   26.0    44.2 10.4  10083_SNUH_P33 14APR2016  2 24-Mar-15
## 1891 60   45.5    64.8 45.5  10083_SNUH_P34 15SEP2015  2 15-Sep-15
## 1901 60   45.5    64.8 45.1  10083_SNUH_P34 19DEC2015  2 15-Sep-15
## 1916 60   45.5    64.8 48.8  10083_SNUH_P34 17MAY2016  2 15-Sep-15
## 1920 60   45.5    64.8 43.2  10083_SNUH_P34 12JAN2017  2 15-Sep-15
## 1934 52   15.9    42.4 15.9  10083_SNUH_P35 27JAN2014  2 27-Jan-14
## 1943 52   15.9    42.4 12.9  10083_SNUH_P35 03DEC2015  2 27-Jan-14
## 1946 52   17.5    42.0 16.8  10083_SNUH_P36 14AUG2009  2 14-Aug-09
## 1962 52   17.5    42.0 16.0  10083_SNUH_P36 18FEB2010  2 14-Aug-09
## 1970 52   17.5    42.0 42.7  10083_SNUH_P36 03APR2014  2 14-Aug-09
## 1980 65   11.2    19.2 11.2  10083_SNUH_P37 09MAY2012  2  9-May-12
## 1984 65   11.2    19.2  9.5  10083_SNUH_P37 11DEC2013  2  9-May-12
## 1994 65   11.2    19.2 13.4  10083_SNUH_P37 06FEB2015  2  9-May-12
## 2001 56   20.5    36.5 20.5  10083_SNUH_P38 02NOV2012  1  2-Nov-12
## 2012 56   20.5    36.5 34.9  10083_SNUH_P38 27MAR2013  1  2-Nov-12
## 2017 56   20.5    36.5 27.5  10083_SNUH_P38 29DEC2015  1  2-Nov-12
## 2031 56   20.5    36.5  9.1  10083_SNUH_P38 27JUN2017  1  2-Nov-12
## 2035 56    7.0    33.5  7.0  10083_SNUH_P39 29MAY2014  2 29-May-14
## 2044 56    7.0    33.5  6.4  10083_SNUH_P39 19MAY2016  2 29-May-14
## 2057 56    7.0    33.5  7.5  10083_SNUH_P39 17JUL2016  2 29-May-14
## 2069 41   21.8    53.8 21.8  10083_SNUH_P40 01NOV2013  1  1-Nov-13
## 2073 41   21.8    53.8 11.9  10083_SNUH_P40 17AUG2016  1  1-Nov-13
## 2086 34    2.3    24.3  2.3  10083_SNUH_P41 27JAN2012  2 27-Jan-12
## 2095 34    2.3    24.3  5.0  10083_SNUH_P41 13MAR2012  2 27-Jan-12
## 2105 34    2.3    24.3  3.7  10083_SNUH_P41 23MAY2012  2 27-Jan-12
## 2113 34    2.3    24.3  3.6  10083_SNUH_P41 06SEP2012  2 27-Jan-12
## 2123 63    7.1    16.8  7.1  10083_SNUH_P42 27MAY2015  2 27-May-15
## 2130 63    7.1    16.8  7.3  10083_SNUH_P42 18DEC2016  2 27-May-15
## 2134 59    6.6    13.5  6.6  10083_SNUH_P43 07AUG2014  2  7-Aug-14
## 2145 59    6.6    13.5  8.6  10083_SNUH_P43 24OCT2014  2  7-Aug-14
## 2152 59    6.6    13.5  7.1  10083_SNUH_P43 26JAN2015  2  7-Aug-14
## 2167 59    6.6    13.5  4.4  10083_SNUH_P43 25AUG2015  2  7-Aug-14
## 2170 59    6.6    13.5  5.7  10083_SNUH_P43 03FEB2016  2  7-Aug-14
## 2186 59    6.6    13.5  8.0  10083_SNUH_P43 18MAR2017  2  7-Aug-14
## 2192 47   14.1    40.3 14.1  10083_SNUH_P44 30JUN2009  2 30-Jun-09
## 2200 47   14.1    40.3 19.2  10083_SNUH_P44 30APR2014  2 30-Jun-09
## 2207 47   14.1    40.3 20.1  10083_SNUH_P44 20APR2015  2 30-Jun-09
## 2222 47   14.1    40.3 27.0  10083_SNUH_P44 13JUL2016  2 30-Jun-09
## 2229 47   14.1    40.3 20.5  10083_SNUH_P44 02AUG2017  2 30-Jun-09
## 2236 61    8.3    27.7  7.4  10083_SNUH_P45 17FEB2011  2 17-Feb-11
## 2245 61    8.3    27.7 10.5  10083_SNUH_P45 15MAY2012  2 17-Feb-11
## 2254 61    8.3    27.7  6.0  10083_SNUH_P45 16AUG2016  2 17-Feb-11
## 2265 51    4.0    15.0  4.0  10083_SNUH_P46 02APR2014  1  2-Apr-14
## 2273 51    4.0    15.0  2.4  10083_SNUH_P46 17JUL2014  1  2-Apr-14
## 2283 57    1.0     9.7  1.0  10083_SNUH_P47 11FEB2016  2 11-Feb-16
## 2291 57    1.0     9.7  1.2  10083_SNUH_P47 14FEB2017  2 11-Feb-16
##      CumPD5_V1V2 MCumPD_V1V2 HiPD_V1V2 CsA_V1V2 CTX_V1V2 AZT_V1V2 Tac_V1V2
## 3             0        0.00         0        0        0        0        0
## 18            0        0.00         0        0        0        0        0
## 29            0        0.00         0        0        0        0        0
```

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## 35          0      0.00       0      0      0      0      0
## 44          0      0.00       0      0      0      0      0
## 51          0      0.00       0      0      0      0      0
## 55          0      0.00       0      0      0      0      0
## 66          0      0.00       0      0      0      0      0
## 76          0      5.00       0      0      0      1      0
## 79          0      5.00       0      0      0      1      0
## 104         0      5.00       0      0      0      1      0
## 107         0      5.00       0      0      0      1      0
## 111         0      5.00       0      0      0      1      0
## 119         0      5.00       0      1      0      0      1
## 123         0      5.00       0      1      0      0      1
## 127         0      5.00       0      1      0      0      1
## 146         1     22.50       0      1      0      0      0
## 155         1     22.50       0      1      0      0      0
## 166         1     22.50       0      1      0      0      0
## 176         1     22.50       0      1      0      0      0
## 183         1     15.00       0      1      1      0      0
## 192         1     15.00       0      1      1      0      0
## 203         1     15.00       0      1      1      0      0
## 215         1     15.00       0      1      1      0      0
## 223         1     15.00       0      1      1      0      0
## 237         1     15.00       0      1      1      0      0
## 242         1     15.00       0      1      1      0      0
## 246         1      8.70       0      0      1      0      0
## 257         1      8.70       0      0      1      0      0
## 265         0      3.40       0      0      0      0      0
## 268         0      3.40       0      0      0      0      0
## 291         0      3.10       0      1      0      0      0
## 300         0      3.10       0      1      0      0      0
## 309         0      3.10       0      1      0      0      0
## 311         0      3.10       0      1      0      0      0
## 321         0      3.10       0      1      0      0      0
## 331         0      3.10       0      1      0      0      0
## 339         0      3.10       0      1      0      0      0
## 347         0      3.10       0      1      0      0      0
## 352         0      3.10       0      1      0      0      0
## 367         1      7.50       0      0      0      0      0
## 369         1      7.50       0      0      0      0      0
## 376         1      7.50       0      0      0      0      0
## 394         1      9.30       1      1      0      1      0
## 400         1      9.30       1      1      0      1      0
## 413         1      9.30       1      1      0      1      0
## 423         1      9.30       1      1      0      1      0
## 427         0      0.80       0      0      0      0      1
## 443         0      0.80       0      0      0      0      1
## 446         0      0.80       0      0      0      0      1
## 453         1     36.00       1      1      0      0      0
## 466         1     36.00       1      1      0      0      0
## 471         1     36.00       1      1      0      0      0
## 482         1     36.00       1      1      0      0      0
## 489         1     44.20       1      1      0      0      0
## 497         1     44.20       1      1      0      0      0
## 498         1     44.20       1      1      0      0      0
```

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```
## 502          1      44.20        1        1        0        0        0
## 516          1      44.20        1        1        0        0        0
## 530          1      44.20        1        1        0        0        0
## 537          1      44.20        1        1        0        0        0
## 554          1      11.70        0        1        0        0        0
## 559          1      11.70        0        1        0        0        0
## 575          1      11.70        0        1        0        0        0
## 580          1      12.30        1        0        0        1        0
## 586          1      12.30        1        0        0        1        0
## 590          1      12.30        1        0        0        1        0
## 608          1      72.90        1        1        0        0        0
## 612          1      72.90        1        1        0        0        0
## 617          1      72.90        1        1        0        0        0
## 629          1      72.90        1        1        0        0        0
## 640          1      12.10        1        1        0        1        0
## 647          1      12.10        1        1        0        1        0
## 661          1      33.10        1        1        0        0        0
## 666          1      33.10        1        1        0        0        0
## 681          1      33.10        1        1        0        0        0
## 692          1      33.10        1        1        0        0        0
## 701          1      33.10        1        1        0        0        0
## 705          1       6.60        0        0        0        0        0
## 712          1       6.60        0        0        0        0        0
## 725          1      34.40        0        0        0        0        0
## 732          1      34.40        0        0        0        0        0
## 747          1      34.40        0        0        0        0        0
## 751          1      18.80        0        0        0        0        0
## 765          1      18.80        0        0        0        0        0
## 770          1      25.70        1        0        1        0        0
## 774          1      25.70        1        0        1        0        0
## 776          1      25.70        1        0        1        0        0
## 801          1      30.10        1        0        0        0        1
## 810          1      30.10        1        0        0        0        1
## 823          1      35.70        1        1        1        1        0
## 832          1      35.70        1        1        1        1        0
## 836          1      35.70        1        1        1        1        0
## 848          1      20.80        0        1        0        0        1
## 852          1      20.80        0        1        0        0        1
## 860          1       8.10        0        0        0        0        1
## 872          1       8.10        0        0        0        0        1
## 877          1      21.00        1        1        0        0        0
## 884          1      21.00        1        1        0        0        0
## 896          1      50.50        1        1        0        0        0
## 908          1      50.50        1        1        0        0        0
## 911          1      10.90        0        0        0        1        0
## 920          1      10.90        0        0        0        1        0
## 936          1      11.20        0        1        0        0        0
## 942          1      11.20        0        1        0        0        0
## 956          1      18.20        1        1        0        0        0
## 959          1      18.20        1        1        0        0        0
## 976          1      15.90        1        0        0        1        0
## 979          1      15.90        1        0        0        1        0
## 994          1      13.70        0        0        0        1        0
## 997          1      13.70        0        0        0        1        0
```

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```
## 1013    1    20.35    1    0    1    0    0
## 1015    1    20.35    1    0    1    0    0
## 1028    1     8.88    0    0    0    0    1
## 1031    1     8.88    0    0    0    0    1
## 1040    1     8.88    0    0    0    0    1
## 1047    0     0.00    0    0    0    0    0
## 1059    0     0.00    0    0    0    0    0
## 1065    1    20.61    0    1    0    0    0
## 1080    1    20.61    0    1    0    0    0
## 1093    1     9.84    0    1    0    0    0
## 1096    1     9.84    0    1    0    0    0
## 1110    1     9.51    0    0    0    0    0
## 1116    1     9.51    0    0    0    0    0
## 1121    1     9.51    0    0    0    0    0
## 1139    1    30.00    0    0    0    0    0
## 1146    1    30.00    0    0    0    0    0
## 1149    1    30.00    0    0    0    0    0
## 1161    1    30.00    0    0    0    0    0
## 1166    1    30.00    0    0    0    0    0
## 1177    0     2.64    0    0    0    0    0
## 1182    0     2.64    0    0    0    0    0
## 1195    1     5.39    0    1    0    0    0
## 1201    1     5.39    0    1    0    0    0
## 1211    1     5.39    0    1    0    0    0
## 1220    1    22.20    0    0    0    0    0
## 1233    1    22.20    0    0    0    0    0
## 1243    1    22.20    0    0    0    0    0
## 1246    1    22.20    0    0    0    0    0
## 1249    1    22.20    0    0    0    0    0
## 1277    1    17.50    0    1    0    0    0
## 1280    1    17.50    0    1    0    0    0
## 1283    1    17.50    0    1    0    0    0
## 1293    1    23.76    1    0    1    1    0
## 1299    1    23.76    1    0    1    1    0
## 1317    1    23.76    1    0    1    1    0
## 1321    1    23.76    1    0    1    1    0
## 1332    1    22.38    0    1    0    0    0
## 1336    1    22.38    0    1    0    0    0
## 1353    1     6.21    0    0    0    0    0
## 1356    1     6.21    0    0    0    0    0
## 1365    1     6.21    0    0    0    0    0
## 1366    1     6.21    0    0    0    0    0
## 1371    1     6.21    0    0    0    0    0
## 1400    1    18.71    1    0    0    1    0
## 1401    1    18.71    1    0    0    1    0
## 1411    0     0.00    0    0    0    0    0
## 1414    0     0.00    0    0    0    0    0
## 1434    0     0.00    0    0    0    0    0
## 1436    0     0.00    0    0    0    0    0
## 1444    1     5.37    0    0    0    1    0
## 1461    1     5.37    0    0    0    1    0
## 1464    1     5.37    0    0    0    1    0
## 1479    1    13.34    1    1    0    0    0
## 1484    1    13.34    1    1    0    0    0
```

```
## 1493     0      3.75      0      0      0      1      0
## 1501     0      3.75      0      0      0      1      0
## 1507     0      3.75      0      0      0      1      0
## 1513     0      3.78      0      0      0      0      0
## 1536     0      3.78      0      0      0      0      0
## 1547     0      3.78      0      0      0      0      0
## 1550     0      3.78      0      0      0      0      0
## 1558     0      3.78      0      0      0      0      0
## 1566     0      3.78      0      0      0      0      0
## 1574     0      3.78      0      0      0      0      0
## 1576     1     10.24      0      0      0      1      0
## 1588     1     10.24      0      0      0      1      0
## 1597     1     12.43      0      0      1      0      0
## 1608     1     12.43      0      0      1      0      0
## 1624     0      0.00      0      0      0      0      0
## 1633     0      0.00      0      0      0      0      0
## 1636     0      0.00      0      0      0      0      0
## 1644     0      0.00      0      0      0      0      0
## 1657    NA        NA     NA     NA     NA     NA     NA
## 1661    NA        NA     NA     NA     NA     NA     NA
## 1668     1     15.23      0      1      0      0      0
## 1680     1     15.23      0      1      0      0      0
## 1688     1      7.74      0      0      0      0      0
## 1695     1      7.74      0      0      0      0      0
## 1708     1     16.07      0      1      0      0      0
## 1712     1     16.07      0      1      0      0      0
## 1724     0      4.51      0      0      0      0      0
## 1736     0      4.51      0      0      0      0      0
## 1739     0      4.51      0      0      0      0      0
## 1747     0      4.51      0      0      0      0      0
## 1761     0      4.51      0      0      0      0      0
## 1766     1      8.98      0      0      0      0      0
## 1778     1      8.98      0      0      0      0      0
## 1788     1      5.12      0      0      0      0      0
## 1794     1      5.12      0      0      0      0      0
## 1806     0      4.99      0      0      0      1      0
## 1816     0      4.99      0      0      0      1      0
## 1823     1     12.50      0      0      0      1      0
## 1830     1     12.50      0      0      0      1      0
## 1840     1     12.50      0      0      0      1      0
## 1847     1     12.50      0      0      0      1      0
## 1863     1     12.50      0      0      0      1      0
## 1871     1     12.50      0      0      0      1      0
## 1874     1      5.93      0      0      0      0      0
## 1885     1      5.93      0      0      0      0      0
## 1891     1     16.93      0      1      0      0      0
## 1901     1     16.93      0      1      0      0      0
## 1916     1     16.93      0      1      0      0      0
## 1920     1     16.93      0      1      0      0      0
## 1934     1     15.59      1      0      0      0      0
## 1943     1     15.59      1      0      0      0      0
## 1946     1     10.00      0      0      0      0      0
## 1962     1     10.00      0      0      0      0      0
## 1970     1     10.00      0      0      0      0      0
```

```
## 1980             1       7.50          0          0          0          0          0
## 1984             1       7.50          0          0          0          0          0
## 1994             1       7.50          0          0          0          0          0
## 2001             1      39.28          1          1          0          0          1
## 2012             1      39.28          1          1          0          0          1
## 2017             1      39.28          1          1          0          0          1
## 2031             1      39.28          1          1          0          0          1
## 2035             0       0.00          0          0          0          0          0
## 2044             0       0.00          0          0          0          0          0
## 2057             0       0.00          0          0          0          0          0
## 2069             1      22.20          1          1          0          1          0
## 2073             1      22.20          1          1          0          1          0
## 2086             1      21.49          0          0          0          0          0
## 2095             1      21.49          0          0          0          0          0
## 2105             1      21.49          0          0          0          0          0
## 2113             1      21.49          0          0          0          0          0
## 2123             1       5.65          0          0          0          0          0
## 2130             1       5.65          0          0          0          0          0
## 2134             1      10.00          0          0          0          1          0
## 2145             1      10.00          0          0          0          1          0
## 2152             1      10.00          0          0          0          1          0
## 2167             1      10.00          0          0          0          1          0
## 2170             1      10.00          0          0          0          1          0
## 2186             1      10.00          0          0          0          1          0
## 2192             1       5.00          0          0          0          1          0
## 2200             1       5.00          0          0          0          1          0
## 2207             1       5.00          0          0          0          1          0
## 2222             1       5.00          0          0          0          1          0
## 2229             1       5.00          0          0          0          1          0
## 2236             0       0.00          0          0          0          1          0
## 2245             0       0.00          0          0          0          1          0
## 2254             0       0.00          0          0          0          1          0
## 2265             1      38.67          1          0          0          0          0
## 2273             1      38.67          1          0          0          0          0
## 2283             1       5.00          0          0          0          1          0
## 2291             1       5.00          0          0          0          1          0
##      MMF_V1V2 MTX_V1V2 IVIg_V1V2 RTX_V1V2 ISswitch_V1V2 ISScause_V1V2
## 3           0        0         0        0             0            NA
## 18          0        0         0        0             0            NA
## 29          0        0         0        0             0            NA
## 35          0        0         0        0             0            NA
## 44          0        0         0        0             0            NA
## 51          0        0         0        0             0            NA
## 55          0        0         0        0             0            NA
## 66          0        0         0        0             0            NA
## 76          0        1         0        0             0            NA
## 79          0        1         0        0             0            NA
## 104         0        1         0        0             1             3
## 107         0        1         0        0             1             3
## 111         0        1         0        0             1             3
## 119         0        0         0        0             1             1
## 123         0        0         0        0             1             1
## 127         0        0         0        0             1             1
## 146         0        0         0        0             0            NA
```

```
## 155         0         0         0         0         0         NA
## 166         0         0         0         0         0         NA
## 176         0         0         0         0         0         NA
## 183         0         0         0         0         0         NA
## 192         0         0         0         0         0         NA
## 203         0         0         0         0         0         NA
## 215         0         0         0         0         0         NA
## 223         0         0         0         0         0         NA
## 237         0         0         0         0         0         NA
## 242         0         0         0         0         0         NA
## 246         0         0         0         0         0         NA
## 257         0         0         0         0         0         NA
## 265         0         0         0         0         0         NA
## 268         0         0         0         0         0         NA
## 291         0         1         0         0         0         NA
## 300         0         1         0         0         0         NA
## 309         0         1         0         0         0         NA
## 311         0         1         0         0         0         NA
## 321         0         1         0         0         0         NA
## 331         0         1         0         0         0         NA
## 339         0         1         0         0         0         NA
## 347         0         1         0         0         0         NA
## 352         0         1         0         0         0         NA
## 367         0         0         0         0         0         NA
## 369         0         0         0         0         0         NA
## 376         0         0         0         0         0         NA
## 394         0         1         0         0         1          1
## 400         0         1         0         0         1          1
## 413         0         1         0         0         1          1
## 423         0         1         0         0         1          1
## 427         0         0         0         0         0         NA
## 443         0         0         0         0         0         NA
## 446         0         0         0         0         0         NA
## 453         0         0         0         0         0         NA
## 466         0         0         0         0         0         NA
## 471         0         0         0         0         0         NA
## 482         0         0         0         0         0         NA
## 489         0         0         0         0         0         NA
## 497         0         0         0         0         0         NA
## 498         0         0         0         0         0         NA
## 502         0         0         0         0         0         NA
## 516         0         0         0         0         0         NA
## 530         0         0         0         0         0         NA
## 537         0         0         0         0         0         NA
## 554         0         0         0         0         0         NA
## 559         0         0         0         0         0         NA
## 575         0         0         0         0         0         NA
## 580         0         0         0         0         0         NA
## 586         0         0         0         0         0         NA
## 590         0         0         0         0         0         NA
## 608         0         0         0         0         0         NA
## 612         0         0         0         0         0         NA
## 617         0         0         0         0         0         NA
## 629         0         0         0         0         0         NA
```

```
## 640        0        0        0        0        0        NA
## 647        0        0        0        0        0        NA
## 661        0        0        0        0        0        NA
## 666        0        0        0        0        0        NA
## 681        0        0        0        0        0        NA
## 692        0        0        0        0        0        NA
## 701        0        0        0        0        0        NA
## 705        0        1        0        0        0        NA
## 712        0        1        0        0        0        NA
## 725        0        0        0        0        0        NA
## 732        0        0        0        0        0        NA
## 747        0        0        0        0        0        NA
## 751        0        0        0        0        0        NA
## 765        0        0        0        0        0        NA
## 770        0        0        0        0        0        NA
## 774        0        0        0        0        0        NA
## 776        0        0        0        0        0        NA
## 801        0        0        0        0        0        NA
## 810        0        0        0        0        0        NA
## 823        0        0        0        0        1        1
## 832        0        0        0        0        1        1
## 836        0        0        0        0        1        1
## 848        0        1        1        0        1        1
## 852        0        1        1        0        1        1
## 860        1        0        0        0        1        2
## 872        1        0        0        0        1        2
## 877        0        1        0        0        0        NA
## 884        0        1        0        0        0        NA
## 896        0        0        0        0        0        NA
## 908        0        0        0        0        0        NA
## 911        0        0        0        0        0        NA
## 920        0        0        0        0        0        NA
## 936        0        0        0        0        0        NA
## 942        0        0        0        0        0        NA
## 956        0        0        0        0        0        NA
## 959        0        0        0        0        0        NA
## 976        0        0        0        0        0        NA
## 979        0        0        0        0        0        NA
## 994        0        0        0        0        0        NA
## 997        0        0        0        0        0        NA
## 1013       0        0        0        0        0        NA
## 1015       0        0        0        0        0        NA
## 1028       0        1        0        0        1        1
## 1031       0        1        0        0        1        1
## 1040       0        1        0        0        1        1
## 1047       0        0        0        0        0        NA
## 1059       0        0        0        0        0        NA
## 1065       0        0        0        0        0        NA
## 1080       0        0        0        0        0        NA
## 1093       0        0        0        0        1        1
## 1096       0        0        0        0        1        1
## 1110       0        0        0        0        0        NA
## 1116       0        0        0        0        0        NA
## 1121       0        0        0        0        0        NA
```

```
## 1139        0        0        0        0        0      NA
## 1146        0        0        0        0        0      NA
## 1149        0        0        0        0        0      NA
## 1161        0        0        0        0        0      NA
## 1166        0        0        0        0        0      NA
## 1177        0        0        0        0        0      NA
## 1182        0        0        0        0        0      NA
## 1195        0        0        0        0        1       1
## 1201        0        0        0        0        1       1
## 1211        0        0        0        0        1       1
## 1220        0        0        0        0        0      NA
## 1233        0        0        0        0        0      NA
## 1243        0        0        0        0        0      NA
## 1246        0        0        0        0        0      NA
## 1249        0        0        0        0        0      NA
## 1277        0        0        0        0        0      NA
## 1280        0        0        0        0        0      NA
## 1283        0        0        0        0        0      NA
## 1293        0        0        1        0        1       1
## 1299        0        0        1        0        1       1
## 1317        0        0        1        0        1       1
## 1321        0        0        1        0        1       1
## 1332        0        1        0        0        1       2
## 1336        0        1        0        0        1       2
## 1353        0        0        0        0        0       0
## 1356        0        0        0        0        0       0
## 1365        0        0        0        0        0       0
## 1366        0        0        0        0        0       0
## 1371        0        0        0        0        0       0
## 1400        0        0        0        0        0      NA
## 1401        0        0        0        0        0      NA
## 1411        0        0        0        0        0      NA
## 1414        0        0        0        0        0      NA
## 1434        0        0        0        0        0      NA
## 1436        0        0        0        0        0      NA
## 1444        0        0        0        0        0      NA
## 1461        0        0        0        0        0      NA
## 1464        0        0        0        0        0      NA
## 1479        0        0        0        0        1       2
## 1484        0        0        0        0        1       2
## 1493        0        1        0        0        0      NA
## 1501        0        1        0        0        0      NA
## 1507        0        1        0        0        0      NA
## 1513        0        0        0        0        0      NA
## 1536        0        0        0        0        0      NA
## 1547        0        0        0        0        0      NA
## 1550        0        0        0        0        0      NA
## 1558        0        0        0        0        0      NA
## 1566        0        0        0        0        0      NA
## 1574        0        0        0        0        0      NA
## 1576        0        0        0        0        0      NA
## 1588        0        0        0        0        0      NA
## 1597        0        0        0        0        0      NA
## 1608        0        0        0        0        0      NA
```

```
## 1624        0        0        0        0         0         NA
## 1633        0        0        0        0         0         NA
## 1636        0        0        0        0         0         NA
## 1644        0        0        0        0         0         NA
## 1657       NA       NA       NA       NA        NA         NA
## 1661       NA       NA       NA       NA        NA         NA
## 1668        0        0        0        0         0         NA
## 1680        0        0        0        0         0         NA
## 1688        0        0        0        0         0         NA
## 1695        0        0        0        0         0         NA
## 1708        0        0        0        0         0         NA
## 1712        0        0        0        0         0         NA
## 1724        0        0        0        0         0         NA
## 1736        0        0        0        0         0         NA
## 1739        0        0        0        0         0         NA
## 1747        0        0        0        0         0         NA
## 1761        0        0        0        0         0         NA
## 1766        0        0        0        0         0         NA
## 1778        0        0        0        0         0         NA
## 1788        0        0        0        0         0         NA
## 1794        0        0        0        0         0         NA
## 1806        0        0        0        0         0         NA
## 1816        0        0        0        0         0         NA
## 1823        0        0        0        0         0         NA
## 1830        0        0        0        0         0         NA
## 1840        0        0        0        0         0         NA
## 1847        0        0        0        0         0         NA
## 1863        0        0        0        0         0         NA
## 1871        0        0        0        0         0         NA
## 1874        0        0        0        0         0         NA
## 1885        0        0        0        0         0         NA
## 1891        0        0        0        0         1          1
## 1901        0        0        0        0         1          1
## 1916        0        0        0        0         1          1
## 1920        0        0        0        0         1          1
## 1934        0        0        1        1         1          1
## 1943        0        0        1        1         1          1
## 1946        0        0        0        0         0         NA
## 1962        0        0        0        0         0         NA
## 1970        0        0        0        0         0         NA
## 1980        0        0        0        0         0         NA
## 1984        0        0        0        0         0         NA
## 1994        0        0        0        0         0         NA
## 2001        0        0        0        0         1          1
## 2012        0        0        0        0         1          1
## 2017        0        0        0        0         1          1
## 2031        0        0        0        0         1          1
## 2035        0        0        0        0         0         NA
## 2044        0        0        0        0         0         NA
## 2057        0        0        0        0         0         NA
## 2069        1        0        1        1         1          1
## 2073        1        0        1        1         1          1
## 2086        0        0        0        0         0         NA
## 2095        0        0        0        0         0         NA
```

```
## 2105        0        0        0        0        0    NA
## 2113        0        0        0        0        0    NA
## 2123        0        0        0        0        0    NA
## 2130        0        0        0        0        0    NA
## 2134        0        0        0        0        0    NA
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## 2167        0        0        0        0        0    NA
## 2170        0        0        0        0        0    NA
## 2186        0        0        0        0        0    NA
## 2192        0        1        0        0        0    NA
## 2200        0        1        0        0        0    NA
## 2207        0        1        0        0        0    NA
## 2222        0        1        0        0        0    NA
## 2229        0        1        0        0        0    NA
## 2236        0        0        0        0        0    NA
## 2245        0        0        0        0        0    NA
## 2254        0        0        0        0        0    NA
## 2265        0        0        0        0        0    NA
## 2273        0        0        0        0        0    NA
## 2283        0        0        0        0        0    NA
## 2291        0        0        0        0        0    NA
##          REGION name  date
## 3     WHOLE_LUNG    1 13941
## 18    WHOLE_LUNG    1 14309
## 29    WHOLE_LUNG    1 13577
## 35    WHOLE_LUNG    1 15420
## 44    WHOLE_LUNG    1 15791
## 51    WHOLE_LUNG    1 16153
## 55    WHOLE_LUNG    1 14680
## 66    WHOLE_LUNG    1 15049
## 76    WHOLE_LUNG    2 14195
## 79    WHOLE_LUNG    2 14481
## 104   WHOLE_LUNG    3 14190
## 107   WHOLE_LUNG    3 13350
## 111   WHOLE_LUNG    3 13603
## 119   WHOLE_LUNG    4 16296
## 123   WHOLE_LUNG    4 17317
## 127   WHOLE_LUNG    4 13341
## 146   WHOLE_LUNG    5 13245
## 155   WHOLE_LUNG    5 16881
## 166   WHOLE_LUNG    5 13437
## 176   WHOLE_LUNG    5 15324
## 183   WHOLE_LUNG    6 13508
## 192   WHOLE_LUNG    6 14445
## 203   WHOLE_LUNG    6 14823
## 215   WHOLE_LUNG    6 15278
## 223   WHOLE_LUNG    6 15649
## 237   WHOLE_LUNG    6 14081
## 242   WHOLE_LUNG    6 13755
## 246   WHOLE_LUNG    7 17098
## 257   WHOLE_LUNG    7 16763
## 265   WHOLE_LUNG    8 14054
## 268   WHOLE_LUNG    8 15790
```

```
## 291   WHOLE_LUNG    9 15832
## 300   WHOLE_LUNG    9 15377
## 309   WHOLE_LUNG    9 14053
## 311   WHOLE_LUNG    9 14970
## 321   WHOLE_LUNG    9 16967
## 331   WHOLE_LUNG    9 17415
## 339   WHOLE_LUNG    9 17563
## 347   WHOLE_LUNG    9 16237
## 352   WHOLE_LUNG    9 16583
## 367   WHOLE_LUNG   10 16139
## 369   WHOLE_LUNG   10 13652
## 376   WHOLE_LUNG   10 13444
## 394   WHOLE_LUNG   11 13558
## 400   WHOLE_LUNG   11 17474
## 413   WHOLE_LUNG   11 16262
## 423   WHOLE_LUNG   11 17127
## 427   WHOLE_LUNG   12 14039
## 443   WHOLE_LUNG   12 17456
## 446   WHOLE_LUNG   12 17450
## 453   WHOLE_LUNG   13 16440
## 466   WHOLE_LUNG   13 17044
## 471   WHOLE_LUNG   13 16812
## 482   WHOLE_LUNG   13 17595
## 489   WHOLE_LUNG   14 14571
## 497   WHOLE_LUNG   14 15366
## 498   WHOLE_LUNG   14 14644
## 502   WHOLE_LUNG   14 15078
## 516   WHOLE_LUNG   14 16933
## 530   WHOLE_LUNG   14 17527
## 537   WHOLE_LUNG   14 16554
## 554   WHOLE_LUNG   15 15015
## 559   WHOLE_LUNG   15 15341
## 575   WHOLE_LUNG   15 15542
## 580   WHOLE_LUNG   16 16505
## 586   WHOLE_LUNG   16 17149
## 590   WHOLE_LUNG   16 17344
## 608   WHOLE_LUNG   17 15345
## 612   WHOLE_LUNG   17 15181
## 617   WHOLE_LUNG   17 15425
## 629   WHOLE_LUNG   17 15021
## 640   WHOLE_LUNG   18 16843
## 647   WHOLE_LUNG   18 15141
## 661   WHOLE_LUNG   19 15170
## 666   WHOLE_LUNG   19 15258
## 681   WHOLE_LUNG   19 15848
## 692   WHOLE_LUNG   19 15758
## 701   WHOLE_LUNG   19 15824
## 705   WHOLE_LUNG   20 15827
## 712   WHOLE_LUNG   20 16316
## 725   WHOLE_LUNG   21 15715
## 732   WHOLE_LUNG   21 15566
## 747   WHOLE_LUNG   21 15606
## 751   WHOLE_LUNG   22 15954
## 765   WHOLE_LUNG   22 16307
```

```
## 770  WHOLE_LUNG   23 16170
## 774  WHOLE_LUNG   23 16081
## 776  WHOLE_LUNG   23 16006
## 801  WHOLE_LUNG   24 16241
## 810  WHOLE_LUNG   24 16114
## 823  WHOLE_LUNG   25 17364
## 832  WHOLE_LUNG   25 17539
## 836  WHOLE_LUNG   25 17073
## 848  WHOLE_LUNG   26 17523
## 852  WHOLE_LUNG   26 16767
## 860  WHOLE_LUNG   27 17339
## 872  WHOLE_LUNG   27 17481
## 877  WHOLE_LUNG   28 16338
## 884  WHOLE_LUNG   28 16490
## 896  WHOLE_LUNG   29 16640
## 908  WHOLE_LUNG   29 16564
## 911  WHOLE_LUNG   30 17031
## 920  WHOLE_LUNG   30 17345
## 936  WHOLE_LUNG   31 17429
## 942  WHOLE_LUNG   31 17053
## 956  WHOLE_LUNG   32 17346
## 959  WHOLE_LUNG   32 17097
## 976  WHOLE_LUNG   33 16974
## 979  WHOLE_LUNG   33 17357
## 994  WHOLE_LUNG   34 17543
## 997  WHOLE_LUNG   34 17172
## 1013 WHOLE_LUNG   35 17282
## 1015 WHOLE_LUNG   35 17401
## 1028 WHOLE_LUNG   36 17022
## 1031 WHOLE_LUNG   36 17451
## 1040 WHOLE_LUNG   36 16848
## 1047 WHOLE_LUNG   37 16888
## 1059 WHOLE_LUNG   37 17072
## 1065 WHOLE_LUNG   38 16664
## 1080 WHOLE_LUNG   38 17051
## 1093 WHOLE_LUNG   39 17114
## 1096 WHOLE_LUNG   39 17373
## 1110 WHOLE_LUNG   40 16996
## 1116 WHOLE_LUNG   40 17119
## 1121 WHOLE_LUNG   40 16699
## 1139 WHOLE_LUNG   41 17191
## 1146 WHOLE_LUNG   41 16622
## 1149 WHOLE_LUNG   41 16276
## 1161 WHOLE_LUNG   41 16371
## 1166 WHOLE_LUNG   41 17363
## 1177 WHOLE_LUNG   42 17258
## 1182 WHOLE_LUNG   42 16727
## 1195 WHOLE_LUNG   43 16647
## 1201 WHOLE_LUNG   43 16255
## 1211 WHOLE_LUNG   43 17131
## 1220 WHOLE_LUNG   44 15973
## 1233 WHOLE_LUNG   44 16007
## 1243 WHOLE_LUNG   44 15924
## 1246 WHOLE_LUNG   44 16610
```

```
## 1249 WHOLE_LUNG   44 16975
## 1277 WHOLE_LUNG   45 16125
## 1280 WHOLE_LUNG   45 16034
## 1283 WHOLE_LUNG   45 15939
## 1293 WHOLE_LUNG   46 16662
## 1299 WHOLE_LUNG   46 17385
## 1317 WHOLE_LUNG   46 15991
## 1321 WHOLE_LUNG   46 16511
## 1332 WHOLE_LUNG   47 16020
## 1336 WHOLE_LUNG   47 15936
## 1353 WHOLE_LUNG   48 16118
## 1356 WHOLE_LUNG   48 16483
## 1365 WHOLE_LUNG   48 15657
## 1366 WHOLE_LUNG   48 17189
## 1371 WHOLE_LUNG   48 16615
## 1400 WHOLE_LUNG   49 16123
## 1401 WHOLE_LUNG   49 15520
## 1411 WHOLE_LUNG   50 16955
## 1414 WHOLE_LUNG   50 17381
## 1434 WHOLE_LUNG   50 15551
## 1436 WHOLE_LUNG   50 16488
## 1444 WHOLE_LUNG   51 15418
## 1461 WHOLE_LUNG   51 15917
## 1464 WHOLE_LUNG   51 16245
## 1479 WHOLE_LUNG   52 17159
## 1484 WHOLE_LUNG   52 15632
## 1493 WHOLE_LUNG   53 17111
## 1501 WHOLE_LUNG   53 16419
## 1507 WHOLE_LUNG   53 16762
## 1513 WHOLE_LUNG   54 15024
## 1536 WHOLE_LUNG   54 16541
## 1547 WHOLE_LUNG   54 16947
## 1550 WHOLE_LUNG   54 17409
## 1558 WHOLE_LUNG   54 15757
## 1566 WHOLE_LUNG   54 16135
## 1574 WHOLE_LUNG   54 15388
## 1576 WHOLE_LUNG   55 16330
## 1588 WHOLE_LUNG   55 15399
## 1597 WHOLE_LUNG   56 15043
## 1608 WHOLE_LUNG   56 15101
## 1624 WHOLE_LUNG   57 17395
## 1633 WHOLE_LUNG   57 16490
## 1636 WHOLE_LUNG   57 15841
## 1644 WHOLE_LUNG   57 16077
## 1657 WHOLE_LUNG   58 15953
## 1661 WHOLE_LUNG   58 16118
## 1668 WHOLE_LUNG   59 16542
## 1680 WHOLE_LUNG   59 16962
## 1688 WHOLE_LUNG   60 15974
## 1695 WHOLE_LUNG   60 16725
## 1708 WHOLE_LUNG   61 15195
## 1712 WHOLE_LUNG   61 15208
## 1724 WHOLE_LUNG   62 15404
## 1736 WHOLE_LUNG   62 16091
```

```
## 1739 WHOLE_LUNG    62 16499
## 1747 WHOLE_LUNG    62 16862
## 1761 WHOLE_LUNG    62 17228
## 1766 WHOLE_LUNG    63 15336
## 1778 WHOLE_LUNG    63 15530
## 1788 WHOLE_LUNG    64 15358
## 1794 WHOLE_LUNG    64 17018
## 1806 WHOLE_LUNG    65 14433
## 1816 WHOLE_LUNG    65 15089
## 1823 WHOLE_LUNG    66 14356
## 1830 WHOLE_LUNG    66 14440
## 1840 WHOLE_LUNG    66 14552
## 1847 WHOLE_LUNG    66 14825
## 1863 WHOLE_LUNG    66 15546
## 1871 WHOLE_LUNG    66 16795
## 1874 WHOLE_LUNG    67 16518
## 1885 WHOLE_LUNG    67 16905
## 1891 WHOLE_LUNG    68 16693
## 1901 WHOLE_LUNG    68 16788
## 1916 WHOLE_LUNG    68 16938
## 1920 WHOLE_LUNG    68 17178
## 1934 WHOLE_LUNG    69 16097
## 1943 WHOLE_LUNG    69 16772
## 1946 WHOLE_LUNG    70 14470
## 1962 WHOLE_LUNG    70 14658
## 1970 WHOLE_LUNG    70 16163
## 1980 WHOLE_LUNG    71 15469
## 1984 WHOLE_LUNG    71 16050
## 1994 WHOLE_LUNG    71 16472
## 2001 WHOLE_LUNG    72 15646
## 2012 WHOLE_LUNG    72 15791
## 2017 WHOLE_LUNG    72 16798
## 2031 WHOLE_LUNG    72 17344
## 2035 WHOLE_LUNG    73 16219
## 2044 WHOLE_LUNG    73 16940
## 2057 WHOLE_LUNG    73 16999
## 2069 WHOLE_LUNG    74 16010
## 2073 WHOLE_LUNG    74 17030
## 2086 WHOLE_LUNG    75 15366
## 2095 WHOLE_LUNG    75 15412
## 2105 WHOLE_LUNG    75 15483
## 2113 WHOLE_LUNG    75 15589
## 2123 WHOLE_LUNG    76 16582
## 2130 WHOLE_LUNG    76 17153
## 2134 WHOLE_LUNG    77 16289
## 2145 WHOLE_LUNG    77 16367
## 2152 WHOLE_LUNG    77 16461
## 2167 WHOLE_LUNG    77 16672
## 2170 WHOLE_LUNG    77 16834
## 2186 WHOLE_LUNG    77 17243
## 2192 WHOLE_LUNG    78 14425
## 2200 WHOLE_LUNG    78 16190
## 2207 WHOLE_LUNG    78 16545
## 2222 WHOLE_LUNG    78 16995
```

```
## 2229 WHOLE_LUNG    78 17380
## 2236 WHOLE_LUNG    79 15022
## 2245 WHOLE_LUNG    79 15475
## 2254 WHOLE_LUNG    79 17029
## 2265 WHOLE_LUNG    80 16162
## 2273 WHOLE_LUNG    80 16268
## 2283 WHOLE_LUNG    81 16842
## 2291 WHOLE_LUNG    81 17211
```

```
as.data.frame(d2)
```

```
##      Age V1_WL_QLF V1_WL_QILD         SUBJID   VISITDTN Sex V1_CTdate
## 1     54       6.7       18.6 10083_SNUBH_P01 05MAR2007   2   5-Mar-07
## 2     54       6.7       18.6 10083_SNUBH_P01 03MAR2008   2   5-Mar-07
## 3     54       6.7       18.6 10083_SNUBH_P01 16MAR2011   2   5-Mar-07
## 4     54       6.7       18.6 10083_SNUBH_P01 21MAR2012   2   5-Mar-07
## 5     54       6.7       18.6 10083_SNUBH_P01 06MAR2009   2   5-Mar-07
## 6     54       6.7       18.6 10083_SNUBH_P01 12MAR2010   2   5-Mar-07
## 7     54       6.7       18.6 10083_SNUBH_P01 27MAR2013   2   5-Mar-07
## 8     54       6.7       18.6 10083_SNUBH_P01 24MAR2014   2   5-Mar-07
## 9     68      26.1       48.3 10083_SNUBH_P02 12NOV2008   2  12-Nov-08
## 10    68      26.1       48.3 10083_SNUBH_P02 25AUG2009   2  12-Nov-08
## 11    25       3.5        8.0 10083_SNUBH_P03 07NOV2008   2  21-Jul-06
## 12    25       3.5        8.0 10083_SNUBH_P03 21JUL2006   2  21-Jul-06
## 13    25       3.5        8.0 10083_SNUBH_P03 31MAR2007   2  21-Jul-06
## 14    64      10.9       24.1 10083_SNUBH_P04 12JUL2006   2  12-Jul-06
## 15    64      10.9       24.1 10083_SNUBH_P04 14AUG2014   2  12-Jul-06
## 16    64      10.9       24.1 10083_SNUBH_P04 31MAY2017   2  12-Jul-06
## 17    57       4.6       12.5 10083_SNUBH_P05 16OCT2006   1   7-Apr-06
## 18    57       4.6       12.5 10083_SNUBH_P05 16DEC2011   1   7-Apr-06
## 19    57       4.6       12.5 10083_SNUBH_P05 07APR2006   1   7-Apr-06
## 20    57       4.6       12.5 10083_SNUBH_P05 21MAR2016   1   7-Apr-06
## 21    49      11.0       20.2 10083_SNUBH_P06 30AUG2007   1  26-Dec-06
## 22    49      11.0       20.2 10083_SNUBH_P06 21JUL2008   1  26-Dec-06
## 23    49      11.0       20.2 10083_SNUBH_P06 26DEC2006   1  26-Dec-06
## 24    49      11.0       20.2 10083_SNUBH_P06 31OCT2011   1  26-Dec-06
## 25    49      11.0       20.2 10083_SNUBH_P06 05NOV2012   1  26-Dec-06
## 26    49      11.0       20.2 10083_SNUBH_P06 20JUL2009   1  26-Dec-06
## 27    49      11.0       20.2 10083_SNUBH_P06 02AUG2010   1  26-Dec-06
## 28    48      15.5       36.8 10083_SNUBH_P07 24NOV2015   2  24-Nov-15
## 29    48      15.5       36.8 10083_SNUBH_P07 24OCT2016   2  24-Nov-15
## 30    63      14.1       50.5 10083_SNUBH_P08 24JUN2008   2  24-Jun-08
## 31    63      14.1       50.5 10083_SNUBH_P08 26MAR2013   2  24-Jun-08
## 32    59       7.4       21.1 10083_SNUBH_P09 23JUN2008   2  23-Jun-08
## 33    59       7.4       21.1 10083_SNUBH_P09 27DEC2010   2  23-Jun-08
## 34    59       7.4       21.1 10083_SNUBH_P09 16JUN2014   2  23-Jun-08
## 35    59       7.4       21.1 10083_SNUBH_P09 28MAY2015   2  23-Jun-08
## 36    59       7.4       21.1 10083_SNUBH_P09 07FEB2012   2  23-Jun-08
## 37    59       7.4       21.1 10083_SNUBH_P09 07MAY2013   2  23-Jun-08
## 38    59       7.4       21.1 10083_SNUBH_P09 01FEB2018   2  23-Jun-08
## 39    59       7.4       21.1 10083_SNUBH_P09 15JUN2016   2  23-Jun-08
## 40    59       7.4       21.1 10083_SNUBH_P09 06SEP2017   2  23-Jun-08
## 41    58      11.0       29.4 10083_SNUBH_P10 23OCT2006   2  23-Oct-06
## 42    58      11.0       29.4 10083_SNUBH_P10 19MAY2007   2  23-Oct-06
```

```
## 43   58      11.0       29.4 10083_SNUBH_P10 10MAR2014   2 23-Oct-06
## 44   34       5.0       19.2 10083_SNUBH_P11 11JUL2014   2 14-Feb-07
## 45   34       5.0       19.2 10083_SNUBH_P11 22NOV2016   2 14-Feb-07
## 46   34       5.0       19.2 10083_SNUBH_P11 14FEB2007   2 14-Feb-07
## 47   34       5.0       19.2 10083_SNUBH_P11 04NOV2017   2 14-Feb-07
## 48   69      17.1       46.8 10083_SNUBH_P12 11OCT2017   2  9-Jun-08
## 49   69      17.1       46.8 10083_SNUBH_P12 17OCT2017   2  9-Jun-08
## 50   69      17.1       46.8 10083_SNUBH_P12 09JUN2008   2  9-Jun-08
## 51   39      32.0       58.9 10083_SNUBH_P13 31AUG2016   2  5-Jan-15
## 52   39      32.0       58.9 10083_SNUBH_P13 05MAR2018   2  5-Jan-15
## 53   39      32.0       58.9 10083_SNUBH_P13 05JAN2015   2  5-Jan-15
## 54   39      32.0       58.9 10083_SNUBH_P13 12JAN2016   2  5-Jan-15
## 55   46       3.4       28.5 10083_SNUBH_P14 23NOV2009   2 23-Nov-09
## 56   46       3.4       28.5 10083_SNUBH_P14 27JAN2012   2 23-Nov-09
## 57   46       3.4       28.5 10083_SNUBH_P14 29APR2015   2 23-Nov-09
## 58   46       3.4       28.5 10083_SNUBH_P14 04FEB2010   2 23-Nov-09
## 59   46       3.4       28.5 10083_SNUBH_P14 14APR2011   2 23-Nov-09
## 60   46       3.4       28.5 10083_SNUBH_P14 12MAY2016   2 23-Nov-09
## 61   46       3.4       28.5 10083_SNUBH_P14 27DEC2017   2 23-Nov-09
## 62   57       9.3       28.5 10083_SNUBH_P15 10FEB2011   1 10-Feb-11
## 63   57       9.3       28.5 10083_SNUBH_P15 02JAN2012   1 10-Feb-11
## 64   57       9.3       28.5 10083_SNUBH_P15 21JUL2012   1 10-Feb-11
## 65   61      11.9       35.1 10083_SNUBH_P16 27JUN2017   2 11-Mar-15
## 66   61      11.9       35.1 10083_SNUBH_P16 14DEC2016   2 11-Mar-15
## 67   61      11.9       35.1 10083_SNUBH_P16 11MAR2015   2 11-Mar-15
## 68   52      45.1       75.1 10083_SNUBH_P17 16FEB2011   2 16-Feb-11
## 69   52      45.1       75.1 10083_SNUBH_P17 26JUL2011   2 16-Feb-11
## 70   52      45.1       75.1 10083_SNUBH_P17 06JAN2012   2 16-Feb-11
## 71   52      45.1       75.1 10083_SNUBH_P17 26MAR2012   2 16-Feb-11
## 72   56       3.3        9.4 10083_SNUBH_P18 16JUN2011   1 16-Jun-11
## 73   56       3.3        9.4 10083_SNUBH_P18 12FEB2016   1 16-Jun-11
## 74   42       1.7       16.9 10083_SNUBH_P19 22FEB2013   2 15-Jul-11
## 75   42       1.7       16.9 10083_SNUBH_P19 29APR2013   2 15-Jul-11
## 76   42       1.7       16.9 10083_SNUBH_P19 15JUL2011   2 15-Jul-11
## 77   42       1.7       16.9 10083_SNUBH_P19 11OCT2011   2 15-Jul-11
## 78   42       1.7       16.9 10083_SNUBH_P19 23MAY2013   2 15-Jul-11
## 79   49       0.8        9.9 10083_SNUBH_P20 03SEP2014   2  2-May-13
## 80   49       0.8        9.9 10083_SNUBH_P20 02MAY2013   2  2-May-13
## 81   60       1.5        9.6 10083_SNUBH_P21 14AUG2012   2 14-Aug-12
## 82   60       1.5        9.6 10083_SNUBH_P21 23SEP2012   2 14-Aug-12
## 83   60       1.5        9.6 10083_SNUBH_P21 10JAN2013   2 14-Aug-12
## 84   76      18.9       56.0 10083_SNUBH_P22 25AUG2014   2  6-Sep-13
## 85   76      18.9       56.0 10083_SNUBH_P22 06SEP2013   2  6-Sep-13
## 86   55      11.9       35.0 10083_SNUBH_P23 28OCT2013   2 28-Oct-13
## 87   55      11.9       35.0 10083_SNUBH_P23 11JAN2014   2 28-Oct-13
## 88   55      11.9       35.0 10083_SNUBH_P23 10APR2014   2 28-Oct-13
## 89   32       9.9       17.9 10083_SNUBH_P24 13FEB2014   2 13-Feb-14
## 90   32       9.9       17.9 10083_SNUBH_P24 20JUN2014   2 13-Feb-14
## 91   48       9.3       27.1 10083_SNUBH_P25 08JAN2018   2 29-Sep-16
## 92   48       9.3       27.1 10083_SNUBH_P25 29SEP2016   2 29-Sep-16
## 93   48       9.3       27.1 10083_SNUBH_P25 17JUL2017   2 29-Sep-16
## 94   41       5.2       17.9 10083_SNUBH_P26 28NOV2015   1 28-Nov-15
## 95   41       5.2       17.9 10083_SNUBH_P26 23DEC2017   1 28-Nov-15
## 96   57      14.2       40.5 10083_SNUBH_P27 22JUN2017   1 22-Jun-17
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## 97   57   14.2    40.5 10083_SNUBH_P27 11NOV2017  1 22-Jun-17
## 98   71   12.4    32.9 10083_SNUBH_P28 25SEP2014  1 25-Sep-14
## 99   71   12.4    32.9 10083_SNUBH_P28 24FEB2015  1 25-Sep-14
## 100  42    6.4    20.0 10083_SNUBH_P29 09MAY2015  2  9-May-15
## 101  42    6.4    20.0 10083_SNUBH_P29 24JUL2015  2  9-May-15
## 102  35    7.4    17.0 10083_SNUBH_P30 18AUG2016  2 18-Aug-16
## 103  35    7.4    17.0 10083_SNUBH_P30 28JUN2017  2 18-Aug-16
## 104  37    8.0    21.7 10083_SNUBH_P31 20SEP2017  1  9-Sep-16
## 105  37    8.0    21.7 10083_SNUBH_P31 09SEP2016  1  9-Sep-16
## 106  44   12.3    30.4 10083_SNUBH_P32 29JUN2017  2 23-Oct-16
## 107  44   12.3    30.4 10083_SNUBH_P32 23OCT2016  2 23-Oct-16
## 108  68   15.9    40.9 10083_SNUBH_P33 22JUN2016  2 22-Jun-16
## 109  68   15.9    40.9 10083_SNUBH_P33 10JUL2017  2 22-Jun-16
## 110  59   12.4    48.8 10083_SNUBH_P34 06JAN2017  2  6-Jan-17
## 111  59   12.4    48.8 10083_SNUBH_P34 12JAN2018  2  6-Jan-17
## 112  52    5.9    21.8  10083_SNUH_P01 26APR2017  2 26-Apr-17
## 113  52    5.9    21.8  10083_SNUH_P01 23AUG2017  2 26-Apr-17
## 114  57   11.7    22.4  10083_SNUH_P02 12OCT2017  1 17-Feb-16
## 115  57   11.7    22.4  10083_SNUH_P02 17FEB2016  1 17-Feb-16
## 116  57   11.7    22.4  10083_SNUH_P02 09AUG2016  1 17-Feb-16
## 117  71   20.9    50.2  10083_SNUH_P03 28MAR2016  1 28-Mar-16
## 118  71   20.9    50.2  10083_SNUH_P03 28SEP2016  1 28-Mar-16
## 119  46   26.2    50.2  10083_SNUH_P04 07SEP2016  2 17-Aug-15
## 120  46   26.2    50.2  10083_SNUH_P04 17AUG2015  2 17-Aug-15
## 121  52   19.9    45.2  10083_SNUH_P05 09NOV2016  2  9-Nov-16
## 122  52   19.9    45.2  10083_SNUH_P05 26JUL2017  2  9-Nov-16
## 123  51    1.5    19.3  10083_SNUH_P06 14NOV2016  2 21-Sep-15
## 124  51    1.5    19.3  10083_SNUH_P06 21SEP2015  2 21-Sep-15
## 125  51    1.5    19.3  10083_SNUH_P06 14JUL2016  2 21-Sep-15
## 126  61    8.4    21.8  10083_SNUH_P07 25JUL2014  1 25-Jul-14
## 127  61    8.4    21.8  10083_SNUH_P07 25JAN2017  1 25-Jul-14
## 128  61    8.4    21.8  10083_SNUH_P07 16JUL2017  1 25-Jul-14
## 129  61    8.4    21.8  10083_SNUH_P07 28OCT2014  1 25-Jul-14
## 130  61    8.4    21.8  10083_SNUH_P07 06JUL2015  1 25-Jul-14
## 131  34    2.6    26.7  10083_SNUH_P08 02APR2017  2 19-Oct-15
## 132  34    2.6    26.7  10083_SNUH_P08 19OCT2015  2 19-Oct-15
## 133  75    7.7    34.0  10083_SNUH_P09 31JUL2015  2  4-Jul-14
## 134  75    7.7    34.0  10083_SNUH_P09 26NOV2016  2  4-Jul-14
## 135  75    7.7    34.0  10083_SNUH_P09 04JUL2014  2  4-Jul-14
## 136  57   20.6    43.9  10083_SNUH_P10 29OCT2013  2  7-Aug-13
## 137  57   20.6    43.9  10083_SNUH_P10 24JUN2015  2  7-Aug-13
## 138  57   20.6    43.9  10083_SNUH_P10 07AUG2013  2  7-Aug-13
## 139  57   20.6    43.9  10083_SNUH_P10 25SEP2013  2  7-Aug-13
## 140  57   20.6    43.9  10083_SNUH_P10 23JUN2016  2  7-Aug-13
## 141  53   22.4    57.5  10083_SNUH_P11 25NOV2013  2 22-Aug-13
## 142  53   22.4    57.5  10083_SNUH_P11 24FEB2014  2 22-Aug-13
## 143  53   22.4    57.5  10083_SNUH_P11 22AUG2013  2 22-Aug-13
## 144  53    8.8    22.4  10083_SNUH_P12 15AUG2015  1 13-Oct-13
## 145  53    8.8    22.4  10083_SNUH_P12 07AUG2017  1 13-Oct-13
## 146  53    8.8    22.4  10083_SNUH_P12 13OCT2013  1 13-Oct-13
## 147  53    8.8    22.4  10083_SNUH_P12 17MAR2015  1 13-Oct-13
## 148  48    0.6     4.3  10083_SNUH_P13 19AUG2013  2 19-Aug-13
## 149  48    0.6     4.3  10083_SNUH_P13 11NOV2013  2 19-Aug-13
## 150  41   15.6    32.7  10083_SNUH_P14 17FEB2015  2 13-Nov-12
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## 151   41   15.6      32.7   10083_SNUH_P14 29JUN2015   2 13-Nov-12
## 152   41   15.6      32.7   10083_SNUH_P14 13NOV2012   2 13-Nov-12
## 153   41   15.6      32.7   10083_SNUH_P14 17FEB2014   2 13-Nov-12
## 154   41   15.6      32.7   10083_SNUH_P14 23JAN2017   2 13-Nov-12
## 155   71   10.2      35.7   10083_SNUH_P15 22FEB2014   2 29-Jun-12
## 156   71   10.2      35.7   10083_SNUH_P15 29JUN2012   2 29-Jun-12
## 157   73   22.4      43.6   10083_SNUH_P16 30JUL2012   2 30-Jul-12
## 158   73   22.4      43.6   10083_SNUH_P16 03AUG2017   2 30-Jul-12
## 159   73   22.4      43.6   10083_SNUH_P16 22FEB2015   2 30-Jul-12
## 160   73   22.4      43.6   10083_SNUH_P16 03JUN2016   2 30-Jul-12
## 161   52   15.7      47.9   10083_SNUH_P17 19MAR2012   2 19-Mar-12
## 162   52   15.7      47.9   10083_SNUH_P17 31JUL2013   2 19-Mar-12
## 163   52   15.7      47.9   10083_SNUH_P17 24JUN2014   2 19-Mar-12
## 164   52    7.2      14.6   10083_SNUH_P18 24DEC2016   2 19-Oct-12
## 165   52    7.2      14.6   10083_SNUH_P18 19OCT2012   2 19-Oct-12
## 166   58   18.2      49.8   10083_SNUH_P19 15DEC2014   2 15-Dec-14
## 167   58   18.2      49.8   10083_SNUH_P19 23NOV2015   2 15-Dec-14
## 168   58   18.2      49.8   10083_SNUH_P19 06NOV2016   2 15-Dec-14
## 169   49   10.4      25.5   10083_SNUH_P20 19FEB2011   1 19-Feb-11
## 170   49   10.4      25.5   10083_SNUH_P20 18FEB2012   1 19-Feb-11
## 171   49   10.4      25.5   10083_SNUH_P20 16APR2015   1 19-Feb-11
## 172   49   10.4      25.5   10083_SNUH_P20 26MAY2016   1 19-Feb-11
## 173   49   10.4      25.5   10083_SNUH_P20 31AUG2017   1 19-Feb-11
## 174   49   10.4      25.5   10083_SNUH_P20 21FEB2013   1 19-Feb-11
## 175   49   10.4      25.5   10083_SNUH_P20 06MAR2014   1 19-Feb-11
## 176   43    2.6      21.1   10083_SNUH_P21 29FEB2012   2 29-Feb-12
## 177   43    2.6      21.1   10083_SNUH_P21 17SEP2014   2 29-Feb-12
## 178   28    5.7      12.5   10083_SNUH_P22 10MAR2011   1 10-Mar-11
## 179   28    5.7      12.5   10083_SNUH_P22 07MAY2011   1 10-Mar-11
## 180   39    4.2      15.4   10083_SNUH_P23 24FEB2015   2 16-May-13
## 181   39    4.2      15.4   10083_SNUH_P23 17AUG2017   2 16-May-13
## 182   39    4.2      15.4   10083_SNUH_P23 16MAY2013   2 16-May-13
## 183   39    4.2      15.4   10083_SNUH_P23 07JAN2014   2 16-May-13
## 184   NA     NA        NA   10083_SNUH_P24 05SEP2013  NA    <NA>
## 185   NA     NA        NA   10083_SNUH_P24 17FEB2014  NA    <NA>
## 186   66   18.6      37.4   10083_SNUH_P25 17APR2015   1 17-Apr-15
## 187   66   18.6      37.4   10083_SNUH_P25 10JUN2016   1 17-Apr-15
## 188   69    6.7      24.3   10083_SNUH_P26 26SEP2013   2 26-Sep-13
## 189   69    6.7      24.3   10083_SNUH_P26 17OCT2015   2 26-Sep-13
## 190   63   34.4      55.8   10083_SNUH_P27 09AUG2011   1  9-Aug-11
## 191   63   34.4      55.8   10083_SNUH_P27 22AUG2011   1  9-Aug-11
## 192   33    3.6      19.0   10083_SNUH_P28 05MAR2012   2  5-Mar-12
## 193   33    3.6      19.0   10083_SNUH_P28 21JAN2014   2  5-Mar-12
## 194   33    3.6      19.0   10083_SNUH_P28 05MAR2015   2  5-Mar-12
## 195   33    3.6      19.0   10083_SNUH_P28 02MAR2016   2  5-Mar-12
## 196   33    3.6      19.0   10083_SNUH_P28 03MAR2017   2  5-Mar-12
## 197   40   22.2      56.5   10083_SNUH_P29 28DEC2011   2 28-Dec-11
## 198   40   22.2      56.5   10083_SNUH_P29 09JUL2012   2 28-Dec-11
## 199   52   10.3      24.8   10083_SNUH_P30 19JAN2012   2 19-Jan-12
## 200   52   10.3      24.8   10083_SNUH_P30 05AUG2016   2 19-Jan-12
## 201   56   17.6      48.8   10083_SNUH_P31 08JUL2009   1  8-Jul-09
## 202   56   17.6      48.8   10083_SNUH_P31 25APR2011   1  8-Jul-09
## 203   63    4.0      10.9   10083_SNUH_P32 22APR2009   2 22-Apr-09
## 204   63    4.0      10.9   10083_SNUH_P32 15JUL2009   2 22-Apr-09
```

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## 205 63      4.0      10.9  10083_SNUH_P32 04NOV2009   2 22-Apr-09
## 206 63      4.0      10.9  10083_SNUH_P32 04AUG2010   2 22-Apr-09
## 207 63      4.0      10.9  10083_SNUH_P32 25JUL2012   2 22-Apr-09
## 208 63      4.0      10.9  10083_SNUH_P32 26DEC2015   2 22-Apr-09
## 209 65     26.0      44.2  10083_SNUH_P33 24MAR2015   2 24-Mar-15
## 210 65     26.0      44.2  10083_SNUH_P33 14APR2016   2 24-Mar-15
## 211 60     45.5      64.8  10083_SNUH_P34 15SEP2015   2 15-Sep-15
## 212 60     45.5      64.8  10083_SNUH_P34 19DEC2015   2 15-Sep-15
## 213 60     45.5      64.8  10083_SNUH_P34 17MAY2016   2 15-Sep-15
## 214 60     45.5      64.8  10083_SNUH_P34 12JAN2017   2 15-Sep-15
## 215 52     15.9      42.4  10083_SNUH_P35 27JAN2014   2 27-Jan-14
## 216 52     15.9      42.4  10083_SNUH_P35 03DEC2015   2 27-Jan-14
## 217 52     17.5      42.0  10083_SNUH_P36 14AUG2009   2 14-Aug-09
## 218 52     17.5      42.0  10083_SNUH_P36 18FEB2010   2 14-Aug-09
## 219 52     17.5      42.0  10083_SNUH_P36 03APR2014   2 14-Aug-09
## 220 65     11.2      19.2  10083_SNUH_P37 09MAY2012   2  9-May-12
## 221 65     11.2      19.2  10083_SNUH_P37 11DEC2013   2  9-May-12
## 222 65     11.2      19.2  10083_SNUH_P37 06FEB2015   2  9-May-12
## 223 56     20.5      36.5  10083_SNUH_P38 02NOV2012   1  2-Nov-12
## 224 56     20.5      36.5  10083_SNUH_P38 27MAR2013   1  2-Nov-12
## 225 56     20.5      36.5  10083_SNUH_P38 29DEC2015   1  2-Nov-12
## 226 56     20.5      36.5  10083_SNUH_P38 27JUN2017   1  2-Nov-12
## 227 56      7.0      33.5  10083_SNUH_P39 29MAY2014   2 29-May-14
## 228 56      7.0      33.5  10083_SNUH_P39 19MAY2016   2 29-May-14
## 229 56      7.0      33.5  10083_SNUH_P39 17JUL2016   2 29-May-14
## 230 41     21.8      53.8  10083_SNUH_P40 01NOV2013   1  1-Nov-13
## 231 41     21.8      53.8  10083_SNUH_P40 17AUG2016   1  1-Nov-13
## 232 34      2.3      24.3  10083_SNUH_P41 27JAN2012   2 27-Jan-12
## 233 34      2.3      24.3  10083_SNUH_P41 13MAR2012   2 27-Jan-12
## 234 34      2.3      24.3  10083_SNUH_P41 23MAY2012   2 27-Jan-12
## 235 34      2.3      24.3  10083_SNUH_P41 06SEP2012   2 27-Jan-12
## 236 63      7.1      16.8  10083_SNUH_P42 27MAY2015   2 27-May-15
## 237 63      7.1      16.8  10083_SNUH_P42 18DEC2016   2 27-May-15
## 238 59      6.6      13.5  10083_SNUH_P43 07AUG2014   2  7-Aug-14
## 239 59      6.6      13.5  10083_SNUH_P43 24OCT2014   2  7-Aug-14
## 240 59      6.6      13.5  10083_SNUH_P43 26JAN2015   2  7-Aug-14
## 241 59      6.6      13.5  10083_SNUH_P43 25AUG2015   2  7-Aug-14
## 242 59      6.6      13.5  10083_SNUH_P43 03FEB2016   2  7-Aug-14
## 243 59      6.6      13.5  10083_SNUH_P43 18MAR2017   2  7-Aug-14
## 244 47     14.1      40.3  10083_SNUH_P44 30JUN2009   2 30-Jun-09
## 245 47     14.1      40.3  10083_SNUH_P44 30APR2014   2 30-Jun-09
## 246 47     14.1      40.3  10083_SNUH_P44 20APR2015   2 30-Jun-09
## 247 47     14.1      40.3  10083_SNUH_P44 13JUL2016   2 30-Jun-09
## 248 47     14.1      40.3  10083_SNUH_P44 02AUG2017   2 30-Jun-09
## 249 61      8.3      27.7  10083_SNUH_P45 17FEB2011   2 17-Feb-11
## 250 61      8.3      27.7  10083_SNUH_P45 15MAY2012   2 17-Feb-11
## 251 61      8.3      27.7  10083_SNUH_P45 17FEB2015   2 17-Feb-11
## 252 61      8.3      27.7  10083_SNUH_P45 16AUG2016   2 17-Feb-11
## 253 51      4.0      15.0  10083_SNUH_P46 02APR2014   1  2-Apr-14
## 254 51      4.0      15.0  10083_SNUH_P46 17JUL2014   1  2-Apr-14
## 255 57      1.0       9.7  10083_SNUH_P47 11FEB2016   2 11-Feb-16
## 256 57      1.0       9.7  10083_SNUH_P47 14FEB2017   2 11-Feb-16
##     CumPD5_V1V2 MCumPD_V1V2 HiPD_V1V2 CsA_V1V2 CTX_V1V2 AZT_V1V2 Tac_V1V2
## 1             0        0.00         0        0        0        0        0
```

```
## 2      0     0.00    0    0    0    0    0
## 3      0     0.00    0    0    0    0    0
## 4      0     0.00    0    0    0    0    0
## 5      0     0.00    0    0    0    0    0
## 6      0     0.00    0    0    0    0    0
## 7      0     0.00    0    0    0    0    0
## 8      0     0.00    0    0    0    0    0
## 9      0     5.00    0    0    0    1    0
## 10     0     5.00    0    0    0    1    0
## 11     0     5.00    0    0    0    1    0
## 12     0     5.00    0    0    0    1    0
## 13     0     5.00    0    0    0    1    0
## 14     0     5.00    0    1    0    0    1
## 15     0     5.00    0    1    0    0    1
## 16     0     5.00    0    1    0    0    1
## 17     1    22.50    0    1    0    0    0
## 18     1    22.50    0    1    0    0    0
## 19     1    22.50    0    1    0    0    0
## 20     1    22.50    0    1    0    0    0
## 21     1    15.00    0    1    1    0    0
## 22     1    15.00    0    1    1    0    0
## 23     1    15.00    0    1    1    0    0
## 24     1    15.00    0    1    1    0    0
## 25     1    15.00    0    1    1    0    0
## 26     1    15.00    0    1    1    0    0
## 27     1    15.00    0    1    1    0    0
## 28     1     8.70    0    0    1    0    0
## 29     1     8.70    0    0    1    0    0
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## 31     0     3.40    0    0    0    0    0
## 32     0     3.10    0    1    0    0    0
## 33     0     3.10    0    1    0    0    0
## 34     0     3.10    0    1    0    0    0
## 35     0     3.10    0    1    0    0    0
## 36     0     3.10    0    1    0    0    0
## 37     0     3.10    0    1    0    0    0
## 38     0     3.10    0    1    0    0    0
## 39     0     3.10    0    1    0    0    0
## 40     0     3.10    0    1    0    0    0
## 41     1     7.50    0    0    0    0    0
## 42     1     7.50    0    0    0    0    0
## 43     1     7.50    0    0    0    0    0
## 44     1     9.30    1    1    0    1    0
## 45     1     9.30    1    1    0    1    0
## 46     1     9.30    1    1    0    1    0
## 47     1     9.30    1    1    0    1    0
## 48     0     0.80    0    0    0    0    1
## 49     0     0.80    0    0    0    0    1
## 50     0     0.80    0    0    0    0    1
## 51     1    36.00    1    1    0    0    0
## 52     1    36.00    1    1    0    0    0
## 53     1    36.00    1    1    0    0    0
## 54     1    36.00    1    1    0    0    0
## 55     1    44.20    1    1    0    0    0
```

```
## 56            1        44.20           1           1           0           0           0
## 57            1        44.20           1           1           0           0           0
## 58            1        44.20           1           1           0           0           0
## 59            1        44.20           1           1           0           0           0
## 60            1        44.20           1           1           0           0           0
## 61            1        44.20           1           1           0           0           0
## 62            1        11.70           0           1           0           0           0
## 63            1        11.70           0           1           0           0           0
## 64            1        11.70           0           1           0           0           0
## 65            1        12.30           1           0           0           1           0
## 66            1        12.30           1           0           0           1           0
## 67            1        12.30           1           0           0           1           0
## 68            1        72.90           1           1           0           0           0
## 69            1        72.90           1           1           0           0           0
## 70            1        72.90           1           1           0           0           0
## 71            1        72.90           1           1           0           0           0
## 72            1        12.10           1           1           0           1           0
## 73            1        12.10           1           1           0           1           0
## 74            1        33.10           1           1           0           0           0
## 75            1        33.10           1           1           0           0           0
## 76            1        33.10           1           1           0           0           0
## 77            1        33.10           1           1           0           0           0
## 78            1        33.10           1           1           0           0           0
## 79            1         6.60           0           0           0           0           0
## 80            1         6.60           0           0           0           0           0
## 81            1        34.40           0           0           0           0           0
## 82            1        34.40           0           0           0           0           0
## 83            1        34.40           0           0           0           0           0
## 84            1        18.80           0           0           0           0           0
## 85            1        18.80           0           0           0           0           0
## 86            1        25.70           1           0           1           0           0
## 87            1        25.70           1           0           1           0           0
## 88            1        25.70           1           0           1           0           0
## 89            1        30.10           1           0           0           0           1
## 90            1        30.10           1           0           0           0           1
## 91            1        35.70           1           1           1           1           0
## 92            1        35.70           1           1           1           1           0
## 93            1        35.70           1           1           1           1           0
## 94            1        20.80           0           1           0           0           1
## 95            1        20.80           0           1           0           0           1
## 96            1         8.10           0           0           0           0           1
## 97            1         8.10           0           0           0           0           1
## 98            1        21.00           1           1           0           0           0
## 99            1        21.00           1           1           0           0           0
## 100           1        50.50           1           1           0           0           0
## 101           1        50.50           1           1           0           0           0
## 102           1        10.90           0           0           0           1           0
## 103           1        10.90           0           0           0           1           0
## 104           1        11.20           0           1           0           0           0
## 105           1        11.20           0           1           0           0           0
## 106           1        18.20           1           1           0           0           0
## 107           1        18.20           1           1           0           0           0
## 108           1        15.90           1           0           0           1           0
## 109           1        15.90           1           0           0           1           0
```

```
## 110          1      13.70        0        0        0        1        0
## 111          1      13.70        0        0        0        1        0
## 112          1      20.35        1        0        1        0        0
## 113          1      20.35        1        0        1        0        0
## 114          1       8.88        0        0        0        0        1
## 115          1       8.88        0        0        0        0        1
## 116          1       8.88        0        0        0        0        1
## 117          0       0.00        0        0        0        0        0
## 118          0       0.00        0        0        0        0        0
## 119          1      20.61        0        1        0        0        0
## 120          1      20.61        0        1        0        0        0
## 121          1       9.84        0        1        0        0        0
## 122          1       9.84        0        1        0        0        0
## 123          1       9.51        0        0        0        0        0
## 124          1       9.51        0        0        0        0        0
## 125          1       9.51        0        0        0        0        0
## 126          1      30.00        0        0        0        0        0
## 127          1      30.00        0        0        0        0        0
## 128          1      30.00        0        0        0        0        0
## 129          1      30.00        0        0        0        0        0
## 130          1      30.00        0        0        0        0        0
## 131          0       2.64        0        0        0        0        0
## 132          0       2.64        0        0        0        0        0
## 133          1       5.39        0        1        0        0        0
## 134          1       5.39        0        1        0        0        0
## 135          1       5.39        0        1        0        0        0
## 136          1      22.20        0        0        0        0        0
## 137          1      22.20        0        0        0        0        0
## 138          1      22.20        0        0        0        0        0
## 139          1      22.20        0        0        0        0        0
## 140          1      22.20        0        0        0        0        0
## 141          1      17.50        0        1        0        0        0
## 142          1      17.50        0        1        0        0        0
## 143          1      17.50        0        1        0        0        0
## 144          1      23.76        1        0        1        1        0
## 145          1      23.76        1        0        1        1        0
## 146          1      23.76        1        0        1        1        0
## 147          1      23.76        1        0        1        1        0
## 148          1      22.38        0        1        0        0        0
## 149          1      22.38        0        1        0        0        0
## 150          1       6.21        0        0        0        0        0
## 151          1       6.21        0        0        0        0        0
## 152          1       6.21        0        0        0        0        0
## 153          1       6.21        0        0        0        0        0
## 154          1       6.21        0        0        0        0        0
## 155          1      18.71        1        0        0        1        0
## 156          1      18.71        1        0        0        1        0
## 157          0       0.00        0        0        0        0        0
## 158          0       0.00        0        0        0        0        0
## 159          0       0.00        0        0        0        0        0
## 160          0       0.00        0        0        0        0        0
## 161          1       5.37        0        0        0        1        0
## 162          1       5.37        0        0        0        1        0
## 163          1       5.37        0        0        0        1        0
```

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```
## 164    1   13.34    1    1    0    0    0
## 165    1   13.34    1    1    0    0    0
## 166    0    3.75    0    0    0    1    0
## 167    0    3.75    0    0    0    1    0
## 168    0    3.75    0    0    0    1    0
## 169    0    3.78    0    0    0    0    0
## 170    0    3.78    0    0    0    0    0
## 171    0    3.78    0    0    0    0    0
## 172    0    3.78    0    0    0    0    0
## 173    0    3.78    0    0    0    0    0
## 174    0    3.78    0    0    0    0    0
## 175    0    3.78    0    0    0    0    0
## 176    1   10.24    0    0    0    1    0
## 177    1   10.24    0    0    0    1    0
## 178    1   12.43    0    0    1    0    0
## 179    1   12.43    0    0    1    0    0
## 180    0    0.00    0    0    0    0    0
## 181    0    0.00    0    0    0    0    0
## 182    0    0.00    0    0    0    0    0
## 183    0    0.00    0    0    0    0    0
## 184   NA      NA   NA   NA   NA   NA   NA
## 185   NA      NA   NA   NA   NA   NA   NA
## 186    1   15.23    0    1    0    0    0
## 187    1   15.23    0    1    0    0    0
## 188    1    7.74    0    0    0    0    0
## 189    1    7.74    0    0    0    0    0
## 190    1   16.07    0    1    0    0    0
## 191    1   16.07    0    1    0    0    0
## 192    0    4.51    0    0    0    0    0
## 193    0    4.51    0    0    0    0    0
## 194    0    4.51    0    0    0    0    0
## 195    0    4.51    0    0    0    0    0
## 196    0    4.51    0    0    0    0    0
## 197    1    8.98    0    0    0    0    0
## 198    1    8.98    0    0    0    0    0
## 199    1    5.12    0    0    0    0    0
## 200    1    5.12    0    0    0    0    0
## 201    0    4.99    0    0    0    1    0
## 202    0    4.99    0    0    0    1    0
## 203    1   12.50    0    0    0    1    0
## 204    1   12.50    0    0    0    1    0
## 205    1   12.50    0    0    0    1    0
## 206    1   12.50    0    0    0    1    0
## 207    1   12.50    0    0    0    1    0
## 208    1   12.50    0    0    0    1    0
## 209    1    5.93    0    0    0    0    0
## 210    1    5.93    0    0    0    0    0
## 211    1   16.93    0    1    0    0    0
## 212    1   16.93    0    1    0    0    0
## 213    1   16.93    0    1    0    0    0
## 214    1   16.93    0    1    0    0    0
## 215    1   15.59    1    0    0    0    0
## 216    1   15.59    1    0    0    0    0
## 217    1   10.00    0    0    0    0    0
```

```
## 218        1    10.00     0     0     0     0     0
## 219        1    10.00     0     0     0     0     0
## 220        1     7.50     0     0     0     0     0
## 221        1     7.50     0     0     0     0     0
## 222        1     7.50     0     0     0     0     0
## 223        1    39.28     1     1     0     0     1
## 224        1    39.28     1     1     0     0     1
## 225        1    39.28     1     1     0     0     1
## 226        1    39.28     1     1     0     0     1
## 227        0     0.00     0     0     0     0     0
## 228        0     0.00     0     0     0     0     0
## 229        0     0.00     0     0     0     0     0
## 230        1    22.20     1     1     0     1     0
## 231        1    22.20     1     1     0     1     0
## 232        1    21.49     0     0     0     0     0
## 233        1    21.49     0     0     0     0     0
## 234        1    21.49     0     0     0     0     0
## 235        1    21.49     0     0     0     0     0
## 236        1     5.65     0     0     0     0     0
## 237        1     5.65     0     0     0     0     0
## 238        1    10.00     0     0     0     1     0
## 239        1    10.00     0     0     0     1     0
## 240        1    10.00     0     0     0     1     0
## 241        1    10.00     0     0     0     1     0
## 242        1    10.00     0     0     0     1     0
## 243        1    10.00     0     0     0     1     0
## 244        1     5.00     0     0     0     1     0
## 245        1     5.00     0     0     0     1     0
## 246        1     5.00     0     0     0     1     0
## 247        1     5.00     0     0     0     1     0
## 248        1     5.00     0     0     0     1     0
## 249        0     0.00     0     0     0     1     0
## 250        0     0.00     0     0     0     1     0
## 251        0     0.00     0     0     0     1     0
## 252        0     0.00     0     0     0     1     0
## 253        1    38.67     1     0     0     0     0
## 254        1    38.67     1     0     0     0     0
## 255        1     5.00     0     0     0     1     0
## 256        1     5.00     0     0     0     1     0
##      MMF_V1V2 MTX_V1V2 IVIg_V1V2 RTX_V1V2 ISswitch_V1V2 ISScause_V1V2
## 1          0        0         0        0             0            NA
## 2          0        0         0        0             0            NA
## 3          0        0         0        0             0            NA
## 4          0        0         0        0             0            NA
## 5          0        0         0        0             0            NA
## 6          0        0         0        0             0            NA
## 7          0        0         0        0             0            NA
## 8          0        0         0        0             0            NA
## 9          0        1         0        0             0            NA
## 10         0        1         0        0             0            NA
## 11         0        1         0        0             1             3
## 12         0        1         0        0             1             3
## 13         0        1         0        0             1             3
## 14         0        0         0        0             1             1
```

```
## 15        0         0         0         0          1          1
## 16        0         0         0         0          1          1
## 17        0         0         0         0          0         NA
## 18        0         0         0         0          0         NA
## 19        0         0         0         0          0         NA
## 20        0         0         0         0          0         NA
## 21        0         0         0         0          0         NA
## 22        0         0         0         0          0         NA
## 23        0         0         0         0          0         NA
## 24        0         0         0         0          0         NA
## 25        0         0         0         0          0         NA
## 26        0         0         0         0          0         NA
## 27        0         0         0         0          0         NA
## 28        0         0         0         0          0         NA
## 29        0         0         0         0          0         NA
## 30        0         0         0         0          0         NA
## 31        0         0         0         0          0         NA
## 32        0         1         0         0          0         NA
## 33        0         1         0         0          0         NA
## 34        0         1         0         0          0         NA
## 35        0         1         0         0          0         NA
## 36        0         1         0         0          0         NA
## 37        0         1         0         0          0         NA
## 38        0         1         0         0          0         NA
## 39        0         1         0         0          0         NA
## 40        0         1         0         0          0         NA
## 41        0         0         0         0          0         NA
## 42        0         0         0         0          0         NA
## 43        0         0         0         0          0         NA
## 44        0         1         0         0          1          1
## 45        0         1         0         0          1          1
## 46        0         1         0         0          1          1
## 47        0         1         0         0          1          1
## 48        0         0         0         0          0         NA
## 49        0         0         0         0          0         NA
## 50        0         0         0         0          0         NA
## 51        0         0         0         0          0         NA
## 52        0         0         0         0          0         NA
## 53        0         0         0         0          0         NA
## 54        0         0         0         0          0         NA
## 55        0         0         0         0          0         NA
## 56        0         0         0         0          0         NA
## 57        0         0         0         0          0         NA
## 58        0         0         0         0          0         NA
## 59        0         0         0         0          0         NA
## 60        0         0         0         0          0         NA
## 61        0         0         0         0          0         NA
## 62        0         0         0         0          0         NA
## 63        0         0         0         0          0         NA
## 64        0         0         0         0          0         NA
## 65        0         0         0         0          0         NA
## 66        0         0         0         0          0         NA
## 67        0         0         0         0          0         NA
## 68        0         0         0         0          0         NA
```

```
## 69       0        0        0        0        0       NA
## 70       0        0        0        0        0       NA
## 71       0        0        0        0        0       NA
## 72       0        0        0        0        0       NA
## 73       0        0        0        0        0       NA
## 74       0        0        0        0        0       NA
## 75       0        0        0        0        0       NA
## 76       0        0        0        0        0       NA
## 77       0        0        0        0        0       NA
## 78       0        0        0        0        0       NA
## 79       0        1        0        0        0       NA
## 80       0        1        0        0        0       NA
## 81       0        0        0        0        0       NA
## 82       0        0        0        0        0       NA
## 83       0        0        0        0        0       NA
## 84       0        0        0        0        0       NA
## 85       0        0        0        0        0       NA
## 86       0        0        0        0        0       NA
## 87       0        0        0        0        0       NA
## 88       0        0        0        0        0       NA
## 89       0        0        0        0        0       NA
## 90       0        0        0        0        0       NA
## 91       0        0        0        0        1        1
## 92       0        0        0        0        1        1
## 93       0        0        0        0        1        1
## 94       0        1        1        0        1        1
## 95       0        1        1        0        1        1
## 96       1        0        0        0        1        2
## 97       1        0        0        0        1        2
## 98       0        1        0        0        0       NA
## 99       0        1        0        0        0       NA
## 100      0        0        0        0        0       NA
## 101      0        0        0        0        0       NA
## 102      0        0        0        0        0       NA
## 103      0        0        0        0        0       NA
## 104      0        0        0        0        0       NA
## 105      0        0        0        0        0       NA
## 106      0        0        0        0        0       NA
## 107      0        0        0        0        0       NA
## 108      0        0        0        0        0       NA
## 109      0        0        0        0        0       NA
## 110      0        0        0        0        0       NA
## 111      0        0        0        0        0       NA
## 112      0        0        0        0        0       NA
## 113      0        0        0        0        0       NA
## 114      0        1        0        0        1        1
## 115      0        1        0        0        1        1
## 116      0        1        0        0        1        1
## 117      0        0        0        0        0       NA
## 118      0        0        0        0        0       NA
## 119      0        0        0        0        0       NA
## 120      0        0        0        0        0       NA
## 121      0        0        0        0        1        1
## 122      0        0        0        0        1        1
```

```
## 123          0          0          0          0            0            NA
## 124          0          0          0          0            0            NA
## 125          0          0          0          0            0            NA
## 126          0          0          0          0            0            NA
## 127          0          0          0          0            0            NA
## 128          0          0          0          0            0            NA
## 129          0          0          0          0            0            NA
## 130          0          0          0          0            0            NA
## 131          0          0          0          0            0            NA
## 132          0          0          0          0            0            NA
## 133          0          0          0          0            1             1
## 134          0          0          0          0            1             1
## 135          0          0          0          0            1             1
## 136          0          0          0          0            0            NA
## 137          0          0          0          0            0            NA
## 138          0          0          0          0            0            NA
## 139          0          0          0          0            0            NA
## 140          0          0          0          0            0            NA
## 141          0          0          0          0            0            NA
## 142          0          0          0          0            0            NA
## 143          0          0          0          0            0            NA
## 144          0          0          1          0            1             1
## 145          0          0          1          0            1             1
## 146          0          0          1          0            1             1
## 147          0          0          1          0            1             1
## 148          0          1          0          0            1             2
## 149          0          1          0          0            1             2
## 150          0          0          0          0            0             0
## 151          0          0          0          0            0             0
## 152          0          0          0          0            0             0
## 153          0          0          0          0            0             0
## 154          0          0          0          0            0             0
## 155          0          0          0          0            0            NA
## 156          0          0          0          0            0            NA
## 157          0          0          0          0            0            NA
## 158          0          0          0          0            0            NA
## 159          0          0          0          0            0            NA
## 160          0          0          0          0            0            NA
## 161          0          0          0          0            0            NA
## 162          0          0          0          0            0            NA
## 163          0          0          0          0            0            NA
## 164          0          0          0          0            1             2
## 165          0          0          0          0            1             2
## 166          0          1          0          0            0            NA
## 167          0          1          0          0            0            NA
## 168          0          1          0          0            0            NA
## 169          0          0          0          0            0            NA
## 170          0          0          0          0            0            NA
## 171          0          0          0          0            0            NA
## 172          0          0          0          0            0            NA
## 173          0          0          0          0            0            NA
## 174          0          0          0          0            0            NA
## 175          0          0          0          0            0            NA
## 176          0          0          0          0            0            NA
```

```
## 177        0        0        0        0        0       NA
## 178        0        0        0        0        0       NA
## 179        0        0        0        0        0       NA
## 180        0        0        0        0        0       NA
## 181        0        0        0        0        0       NA
## 182        0        0        0        0        0       NA
## 183        0        0        0        0        0       NA
## 184       NA       NA       NA       NA       NA       NA
## 185       NA       NA       NA       NA       NA       NA
## 186        0        0        0        0        0       NA
## 187        0        0        0        0        0       NA
## 188        0        0        0        0        0       NA
## 189        0        0        0        0        0       NA
## 190        0        0        0        0        0       NA
## 191        0        0        0        0        0       NA
## 192        0        0        0        0        0       NA
## 193        0        0        0        0        0       NA
## 194        0        0        0        0        0       NA
## 195        0        0        0        0        0       NA
## 196        0        0        0        0        0       NA
## 197        0        0        0        0        0       NA
## 198        0        0        0        0        0       NA
## 199        0        0        0        0        0       NA
## 200        0        0        0        0        0       NA
## 201        0        0        0        0        0       NA
## 202        0        0        0        0        0       NA
## 203        0        0        0        0        0       NA
## 204        0        0        0        0        0       NA
## 205        0        0        0        0        0       NA
## 206        0        0        0        0        0       NA
## 207        0        0        0        0        0       NA
## 208        0        0        0        0        0       NA
## 209        0        0        0        0        0       NA
## 210        0        0        0        0        0       NA
## 211        0        0        0        0        1        1
## 212        0        0        0        0        1        1
## 213        0        0        0        0        1        1
## 214        0        0        0        0        1        1
## 215        0        0        1        1        1        1
## 216        0        0        1        1        1        1
## 217        0        0        0        0        0       NA
## 218        0        0        0        0        0       NA
## 219        0        0        0        0        0       NA
## 220        0        0        0        0        0       NA
## 221        0        0        0        0        0       NA
## 222        0        0        0        0        0       NA
## 223        0        0        0        0        1        1
## 224        0        0        0        0        1        1
## 225        0        0        0        0        1        1
## 226        0        0        0        0        1        1
## 227        0        0        0        0        0       NA
## 228        0        0        0        0        0       NA
## 229        0        0        0        0        0       NA
## 230        1        0        1        1        1        1
```

```
## 231               1            0           1           1              1            1
## 232               0            0           0           0              0           NA
## 233               0            0           0           0              0           NA
## 234               0            0           0           0              0           NA
## 235               0            0           0           0              0           NA
## 236               0            0           0           0              0           NA
## 237               0            0           0           0              0           NA
## 238               0            0           0           0              0           NA
## 239               0            0           0           0              0           NA
## 240               0            0           0           0              0           NA
## 241               0            0           0           0              0           NA
## 242               0            0           0           0              0           NA
## 243               0            0           0           0              0           NA
## 244               0            1           0           0              0           NA
## 245               0            1           0           0              0           NA
## 246               0            1           0           0              0           NA
## 247               0            1           0           0              0           NA
## 248               0            1           0           0              0           NA
## 249               0            0           0           0              0           NA
## 250               0            0           0           0              0           NA
## 251               0            0           0           0              0           NA
## 252               0            0           0           0              0           NA
## 253               0            0           0           0              0           NA
## 254               0            0           0           0              0           NA
## 255               0            0           0           0              0           NA
## 256               0            0           0           0              0           NA
##      SLICE_THICKNESS SLICE_SPACING name      size  date
## 1               1.00      2.000000    1 2.000000 13577
## 2               0.67      1.979980    1 1.326587 13941
## 3               1.00      2.000000    1 2.000000 15049
## 4               1.00      2.000000    1 2.000000 15420
## 5               1.00      2.000000    1 2.000000 14309
## 6               1.00      2.000000    1 2.000000 14680
## 7               1.00      2.000000    1 2.000000 15791
## 8               1.00      2.000000    1 2.000000 16153
## 9               1.00      2.000000    2 2.000000 14195
## 10              1.00      2.000000    2 2.000000 14481
## 11              1.00      2.000000    3 2.000000 14190
## 12              1.00      2.000000    3 2.000000 13350
## 13              1.00      2.000000    3 2.000000 13603
## 14              1.00      2.000000    4 2.000000 13341
## 15              1.00      2.000000    4 2.000000 16296
## 16              1.00      1.000000    4 1.000000 17317
## 17              0.67      1.979981    5 1.326587 13437
## 18              1.00      2.000000    5 2.000000 15324
## 19              1.00      2.000000    5 2.000000 13245
## 20              1.00      1.000000    5 1.000000 16881
## 21              1.00      2.000000    6 2.000000 13755
## 22              1.00      2.000000    6 2.000000 14081
## 23              1.00      2.000000    6 2.000000 13508
## 24              1.00      2.000000    6 2.000000 15278
## 25              1.00      2.000000    6 2.000000 15649
## 26              1.00      2.000000    6 2.000000 14445
## 27              1.00      2.000000    6 2.000000 14823
```

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```
## 28             1.00       1.000000    7 1.000000 16763
## 29             1.00       1.000000    7 1.000000 17098
## 30             1.00       2.000000    8 2.000000 14054
## 31             1.00       2.000000    8 2.000000 15790
## 32             1.00       2.000000    9 2.000000 14053
## 33             1.00       2.000000    9 2.000000 14970
## 34             1.00       2.000000    9 2.000000 16237
## 35             1.00       2.000000    9 2.000000 16583
## 36             1.00       2.000000    9 2.000000 15377
## 37             1.00       2.000000    9 2.000000 15832
## 38             1.00       1.000000    9 1.000000 17563
## 39             1.00       1.000000    9 1.000000 16967
## 40               NA             NA    9       NA 17415
## 41             0.67       1.979981   10 1.326587 13444
## 42             0.67       1.979981   10 1.326587 13652
## 43             1.00       2.000000   10 2.000000 16139
## 44             1.00       2.000000   11 2.000000 16262
## 45             1.00       1.000000   11 1.000000 17127
## 46             0.67       1.980010   11 1.326607 13558
## 47             1.00       1.000000   11 1.000000 17474
## 48             1.00       1.000000   12 1.000000 17450
## 49             1.00       1.000000   12 1.000000 17456
## 50             1.00       2.000000   12 2.000000 14039
## 51             1.00       1.000000   13 1.000000 17044
## 52             1.00       1.000000   13 1.000000 17595
## 53             1.00       2.000000   13 2.000000 16440
## 54             1.00       1.000000   13 1.000000 16812
## 55             1.00             NA   14       NA 14571
## 56             1.00             NA   14       NA 15366
## 57             1.00             NA   14       NA 16554
## 58             1.00             NA   14       NA 14644
## 59             1.00             NA   14       NA 15078
## 60             1.00             NA   14       NA 16933
## 61             1.00             NA   14       NA 17527
## 62             1.00       2.000000   15 2.000000 15015
## 63             1.00       2.000000   15 2.000000 15341
## 64             1.00       2.000000   15 2.000000 15542
## 65             1.00       1.000000   16 1.000000 17344
## 66             1.00       1.000000   16 1.000000 17149
## 67             1.00       2.000000   16 2.000000 16505
## 68             1.00       2.000000   17 2.000000 15021
## 69             1.00       2.000000   17 2.000000 15181
## 70             1.00       2.000000   17 2.000000 15345
## 71             1.00       2.000000   17 2.000000 15425
## 72             1.00       2.000000   18 2.000000 15141
## 73             1.00       1.000000   18 1.000000 16843
## 74             1.00       2.000000   19 2.000000 15758
## 75             1.00       2.000000   19 2.000000 15824
## 76             1.00       2.000000   19 2.000000 15170
## 77             1.00       2.000000   19 2.000000 15258
## 78             1.00       2.000000   19 2.000000 15848
## 79             1.00       2.000000   20 2.000000 16316
## 80             1.00       2.000000   20 2.000000 15827
## 81             1.00       2.000000   21 2.000000 15566
```

```
## 82             1.00    2.000000   21 2.000000 15606
## 83             1.00    2.000000   21 2.000000 15715
## 84             1.00    2.000000   22 2.000000 16307
## 85             1.00    2.000000   22 2.000000 15954
## 86               NA          NA   23       NA 16006
## 87             1.00    2.000000   23 2.000000 16081
## 88             1.00    2.000000   23 2.000000 16170
## 89             1.00    2.000000   24 2.000000 16114
## 90             1.00    2.000000   24 2.000000 16241
## 91             1.00    1.000000   25 1.000000 17539
## 92             1.00    1.000000   25 1.000000 17073
## 93             1.00    1.000000   25 1.000000 17364
## 94             1.00    1.000000   26 1.000000 16767
## 95             1.00    1.000000   26 1.000000 17523
## 96             1.00    1.000000   27 1.000000 17339
## 97             1.00    1.000000   27 1.000000 17481
## 98             1.00    2.000000   28 2.000000 16338
## 99             1.00    2.000000   28 2.000000 16490
## 100            1.00    2.000000   29 2.000000 16564
## 101            1.00    2.000000   29 2.000000 16640
## 102            1.00    1.000000   30 1.000000 17031
## 103            1.00    1.000000   30 1.000000 17345
## 104            1.00    1.000000   31 1.000000 17429
## 105              NA          NA   31       NA 17053
## 106            1.00    1.000000   32 1.000000 17346
## 107            1.00    1.000000   32 1.000000 17097
## 108            1.00    1.000000   33 1.000000 16974
## 109            1.00    1.000000   33 1.000000 17357
## 110            1.00    1.000000   34 1.000000 17172
## 111            1.00    1.000000   34 1.000000 17543
## 112            1.00    1.000000   35 1.000000 17282
## 113            1.25    1.250000   35 1.562500 17401
## 114            1.00    1.000000   36 1.000000 17451
## 115            1.00    1.000000   36 1.000000 16848
## 116            1.00    1.000000   36 1.000000 17022
## 117            1.00    1.000000   37 1.000000 16888
## 118            1.00    1.000000   37 1.000000 17072
## 119            1.00    1.000000   38 1.000000 17051
## 120            1.00    1.000000   38 1.000000 16664
## 121            1.00    1.000000   39 1.000000 17114
## 122            1.00    1.000000   39 1.000000 17373
## 123            1.00    1.000000   40 1.000000 17119
## 124            1.00    1.000000   40 1.000000 16699
## 125            1.00    1.000000   40 1.000000 16996
## 126            1.00    1.000000   41 1.000000 16276
## 127            1.00    1.000000   41 1.000000 17191
## 128            1.00    1.000000   41 1.000000 17363
## 129            1.00    1.000000   41 1.000000 16371
## 130            1.00    1.000000   41 1.000000 16622
## 131            1.00    1.000000   42 1.000000 17258
## 132            1.00    1.000000   42 1.000000 16727
## 133            1.00    1.000000   43 1.000000 16647
## 134            1.00    1.000000   43 1.000000 17131
## 135            1.00    1.000000   43 1.000000 16255
```

```
## 136          1.00       1.000000     44 1.000000 16007
## 137          1.00       1.000000     44 1.000000 16610
## 138          1.00       1.000000     44 1.000000 15924
## 139          1.00       1.000000     44 1.000000 15973
## 140          1.00       1.000000     44 1.000000 16975
## 141          1.00       1.000000     45 1.000000 16034
## 142          1.00       1.000000     45 1.000000 16125
## 143          1.00       1.000000     45 1.000000 15939
## 144          1.00       1.000000     46 1.000000 16662
## 145          1.00       1.000000     46 1.000000 17385
## 146          1.00       1.000000     46 1.000000 15991
## 147          1.00       1.000000     46 1.000000 16511
## 148          1.00       1.000000     47 1.000000 15936
## 149          1.00       1.000000     47 1.000000 16020
## 150          1.00             NA     48       NA 16483
## 151          1.00             NA     48       NA 16615
## 152          1.00             NA     48       NA 15657
## 153          1.00             NA     48       NA 16118
## 154          1.25             NA     48       NA 17189
## 155          1.00       1.000000     49 1.000000 16123
## 156          1.00       1.000000     49 1.000000 15520
## 157          1.00       1.000000     50 1.000000 15551
## 158          1.00       1.000000     50 1.000000 17381
## 159          1.00       1.000000     50 1.000000 16488
## 160          1.00       1.000000     50 1.000000 16955
## 161          1.00       1.000000     51 1.000000 15418
## 162          1.00       1.000000     51 1.000000 15917
## 163          1.00       1.000000     51 1.000000 16245
## 164          1.00       1.000000     52 1.000000 17159
## 165          NA             NA     52       NA 15632
## 166          1.00       1.000000     53 1.000000 16419
## 167          1.00       1.000000     53 1.000000 16762
## 168          1.00       1.000000     53 1.000000 17111
## 169          1.00       1.000000     54 1.000000 15024
## 170          1.00       1.000000     54 1.000000 15388
## 171          NA             NA     54       NA 16541
## 172          1.00       1.000000     54 1.000000 16947
## 173          1.00       1.000000     54 1.000000 17409
## 174          1.00       1.000000     54 1.000000 15757
## 175          1.00       1.000000     54 1.000000 16135
## 176          1.00       1.000000     55 1.000000 15399
## 177          1.00       1.000000     55 1.000000 16330
## 178          1.25       1.250000     56 1.562500 15043
## 179          1.00       1.000000     56 1.000000 15101
## 180          1.00       1.000000     57 1.000000 16490
## 181          1.00       1.000000     57 1.000000 17395
## 182          1.00       1.000000     57 1.000000 15841
## 183          1.00       1.000000     57 1.000000 16077
## 184          1.25       1.250000     58 1.562500 15953
## 185          1.00       1.000000     58 1.000000 16118
## 186          1.00       1.000000     59 1.000000 16542
## 187          1.00       1.000000     59 1.000000 16962
## 188          1.00       1.000000     60 1.000000 15974
## 189          NA             NA     60       NA 16725
```

```
## 190            1.00   1.000000   61 1.000000 15195
## 191            1.00   1.000000   61 1.000000 15208
## 192            1.00   1.000000   62 1.000000 15404
## 193            1.00   1.000000   62 1.000000 16091
## 194            1.00   1.000000   62 1.000000 16499
## 195            1.00   1.000000   62 1.000000 16862
## 196            1.00   1.000000   62 1.000000 17228
## 197            1.00   1.000000   63 1.000000 15336
## 198            1.00   1.000000   63 1.000000 15530
## 199            1.00   1.000000   64 1.000000 15358
## 200            1.00   1.000000   64 1.000000 17018
## 201            1.00   1.000000   65 1.000000 14433
## 202            1.00   1.000000   65 1.000000 15089
## 203            1.25   1.250000   66 1.562500 14356
## 204            1.00   1.000000   66 1.000000 14440
## 205            1.00   1.000000   66 1.000000 14552
## 206            1.00   1.000000   66 1.000000 14825
## 207            1.00   1.000000   66 1.000000 15546
## 208            1.00   1.000000   66 1.000000 16795
## 209            1.00   1.000000   67 1.000000 16518
## 210            1.00   1.000000   67 1.000000 16905
## 211            1.00   1.000000   68 1.000000 16693
## 212              NA         NA   68       NA 16788
## 213            1.00   1.000000   68 1.000000 16938
## 214            1.00   1.000000   68 1.000000 17178
## 215            1.00   1.000000   69 1.000000 16097
## 216            1.00   1.000000   69 1.000000 16772
## 217            1.00   1.000000   70 1.000000 14470
## 218              NA         NA   70       NA 14658
## 219            1.00   1.000000   70 1.000000 16163
## 220            1.00   1.000000   71 1.000000 15469
## 221            1.00   1.000000   71 1.000000 16050
## 222            1.00   1.000000   71 1.000000 16472
## 223            1.00         NA   72       NA 15646
## 224            1.00   1.000000   72 1.000000 15791
## 225            1.00   1.000000   72 1.000000 16798
## 226            1.00   1.000000   72 1.000000 17344
## 227            1.00   1.000000   73 1.000000 16219
## 228            1.00   1.000000   73 1.000000 16940
## 229            1.00   1.000000   73 1.000000 16999
## 230            1.00   1.000000   74 1.000000 16010
## 231            1.00   1.000000   74 1.000000 17030
## 232            1.00   1.000000   75 1.000000 15366
## 233            1.00   1.000000   75 1.000000 15412
## 234            1.00   1.000000   75 1.000000 15483
## 235            1.00   1.000000   75 1.000000 15589
## 236            1.00   1.000000   76 1.000000 16582
## 237            1.00   1.000000   76 1.000000 17153
## 238            1.00         NA   77       NA 16289
## 239            1.00         NA   77       NA 16367
## 240            1.00         NA   77       NA 16461
## 241            1.00         NA   77       NA 16672
## 242            1.00         NA   77       NA 16834
## 243            1.00         NA   77       NA 17243
```

```
## 244                 1.00       1.000000     78 1.000000 14425
## 245                 1.00       1.000000     78 1.000000 16190
## 246                 1.00       1.000000     78 1.000000 16545
## 247                 1.00       1.000000     78 1.000000 16995
## 248                 1.00       1.000000     78 1.000000 17380
## 249                 1.00       1.000000     79 1.000000 15022
## 250                 1.00       1.000000     79 1.000000 15475
## 251                 3.00       3.000000     79 9.000000 16483
## 252                 1.00       1.000000     79 1.000000 17029
## 253                 1.00       1.000000     80 1.000000 16162
## 254                 1.25       1.250000     80 1.562500 16268
## 255                 1.00       1.000000     81 1.000000 16842
## 256                 1.00       1.000000     81 1.000000 17211
```

```r
create_sub_dataframes = function(df, dichotomous_vars) {
  # Create a list to store sub-dataframes
  sub_dataframes = list()

  # Loop through each dichotomous variable
  for (var in dichotomous_vars) {
    # Extract unique values of the variable
    unique_vals = unique(df[[var]])

    # Loop through each unique value
    for (val in unique_vals) {
      # Create a sub-dataframe for the current combination of values
      sub_df = df[df[[var]] == val, ]

      # Select columns
      sub_df = select(sub_df, contains("name", ignore.case = TRUE), date, contains("size", ignore.case =

      # Remove missing values using na.omit
      sub_df = na.omit(sub_df)

      # Add the sub-dataframe to the list
      sub_dataframes[[paste0(var, "_", val)]] = sub_df
    }
  }

  # Return the list of sub-dataframes
  return(sub_dataframes)
}
```

```r
# List of dichotomous variables
dichotomous_vars = c("HiPD_V1V2", "CsA_V1V2", "CTX_V1V2","AZT_V1V2",
                     "Tac_V1V2", "MMF_V1V2", "MTX_V1V2", "IVIg_V1V2",
                     "RTX_V1V2", "ISswitch_V1V2")

sub_dataframes = create_sub_dataframes(qlf, dichotomous_vars)
```

```r
# g-d-rate model for treatment HiPD_V1V2

out_hipd_0 = gdrate(sub_dataframes$HiPD_V1V2_0, 0.05, FALSE)
out_hipd_1 = gdrate(sub_dataframes$HiPD_V1V2_1, 0.05, TRUE)
```

ID=17

ID=18

ID=74

ID=80
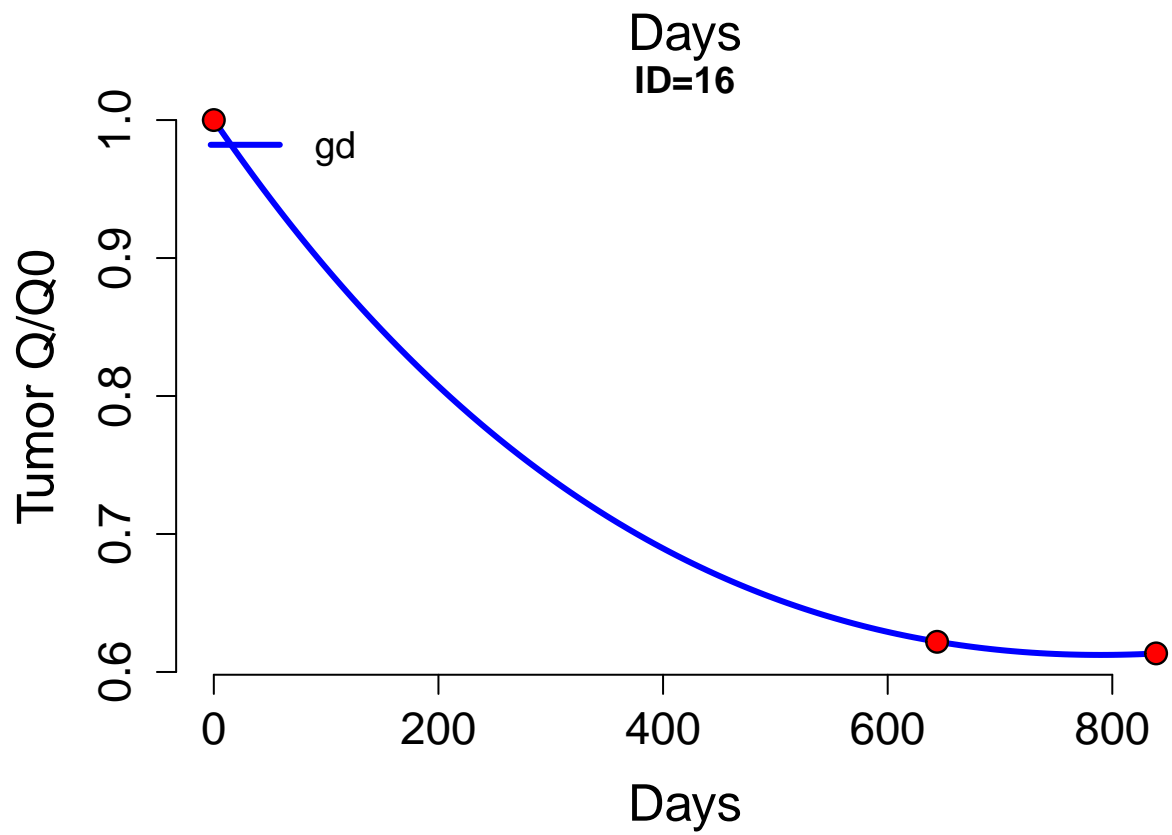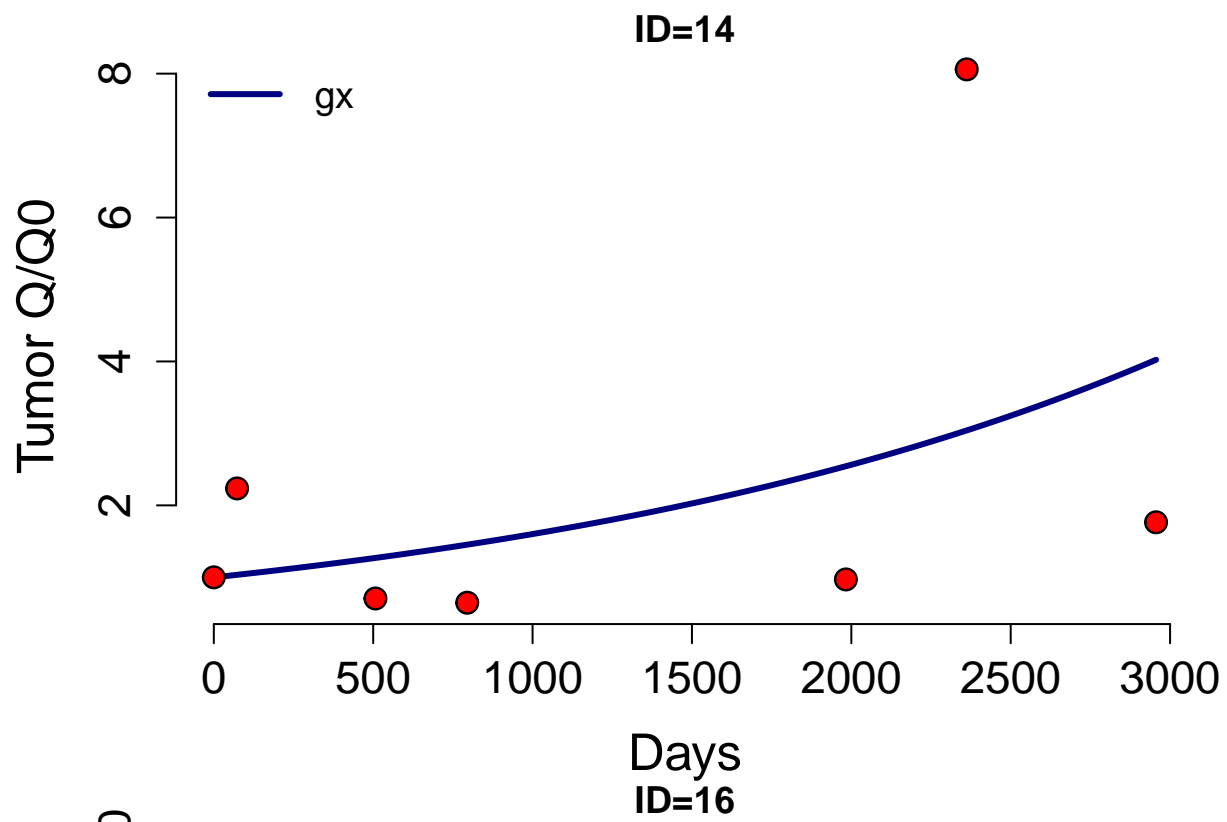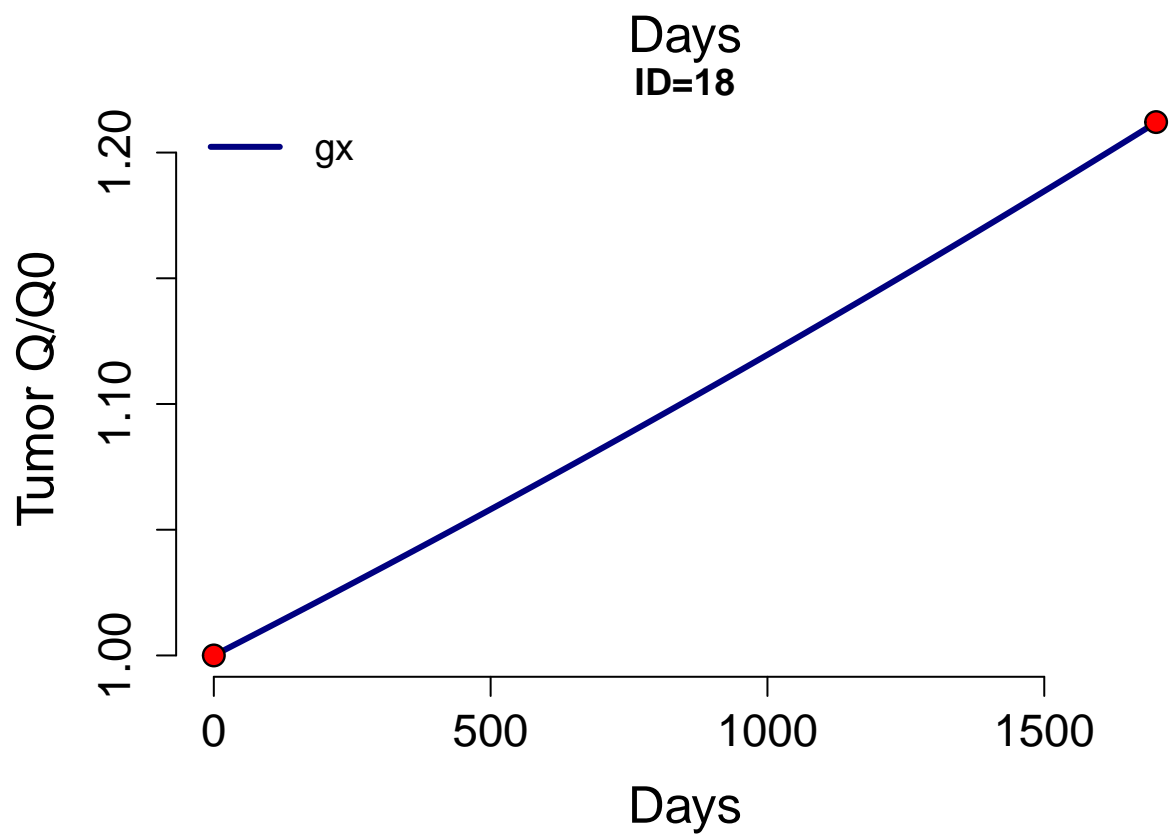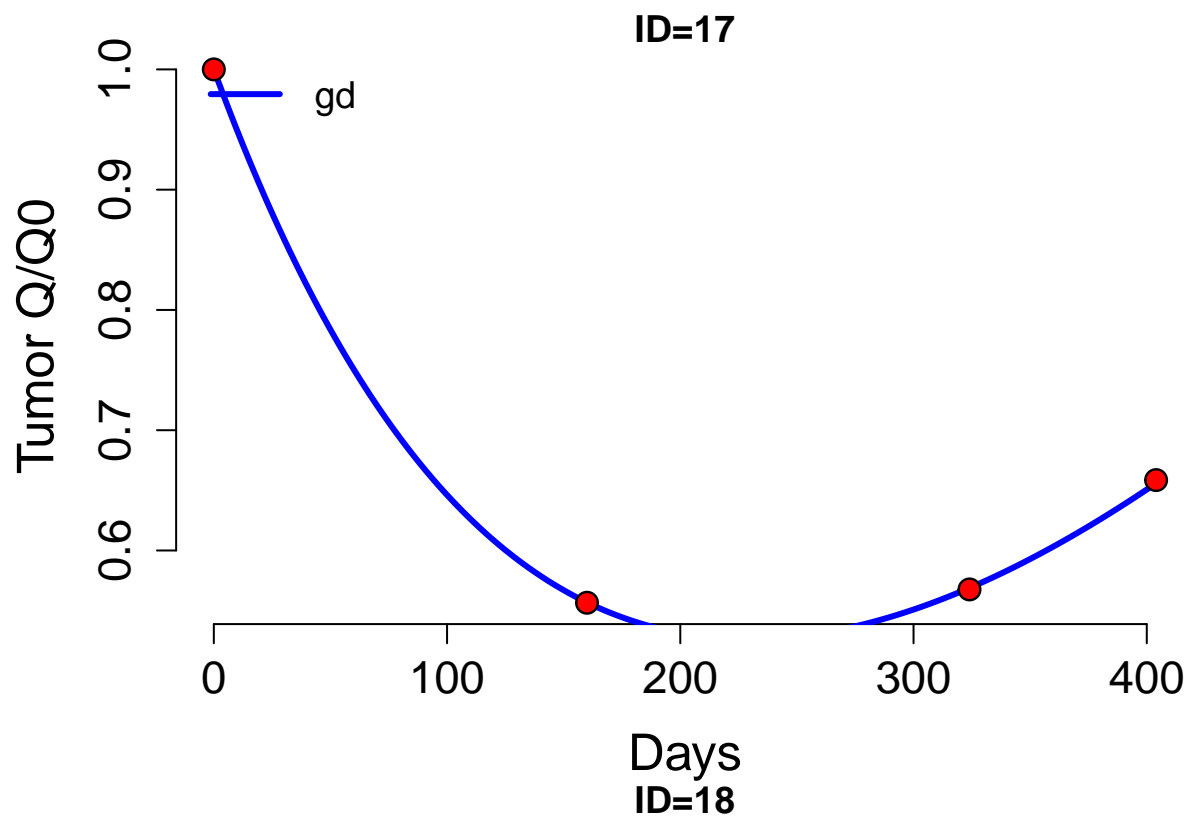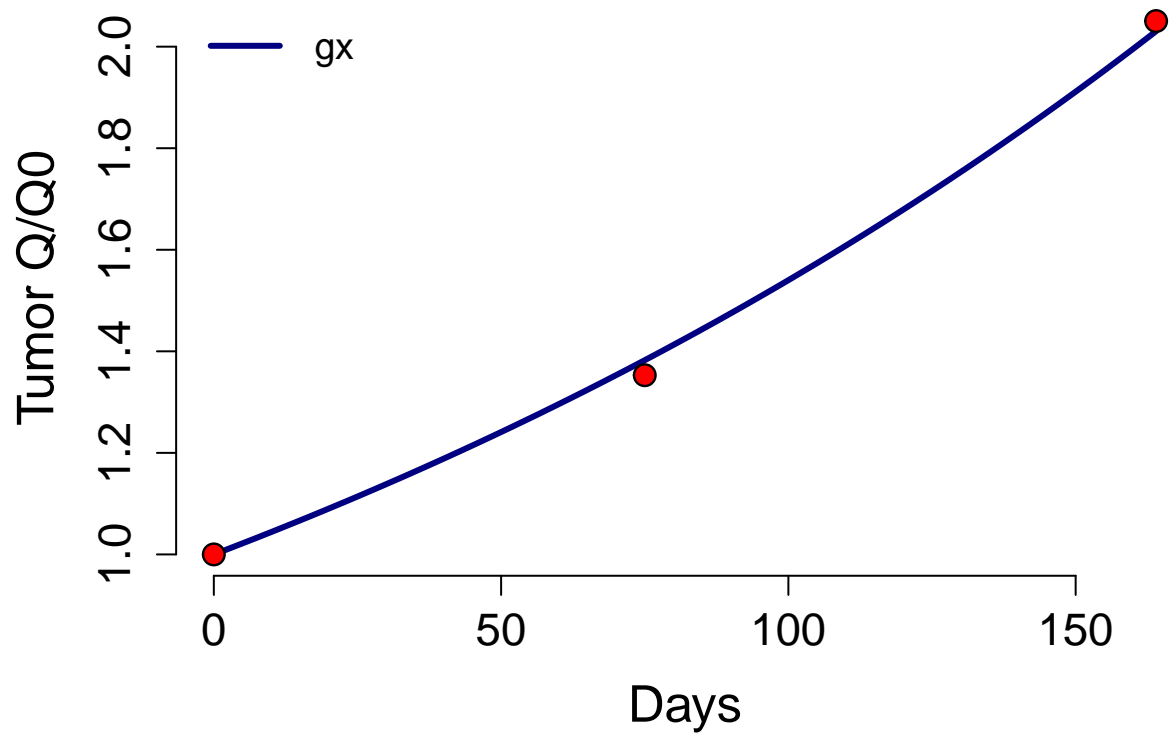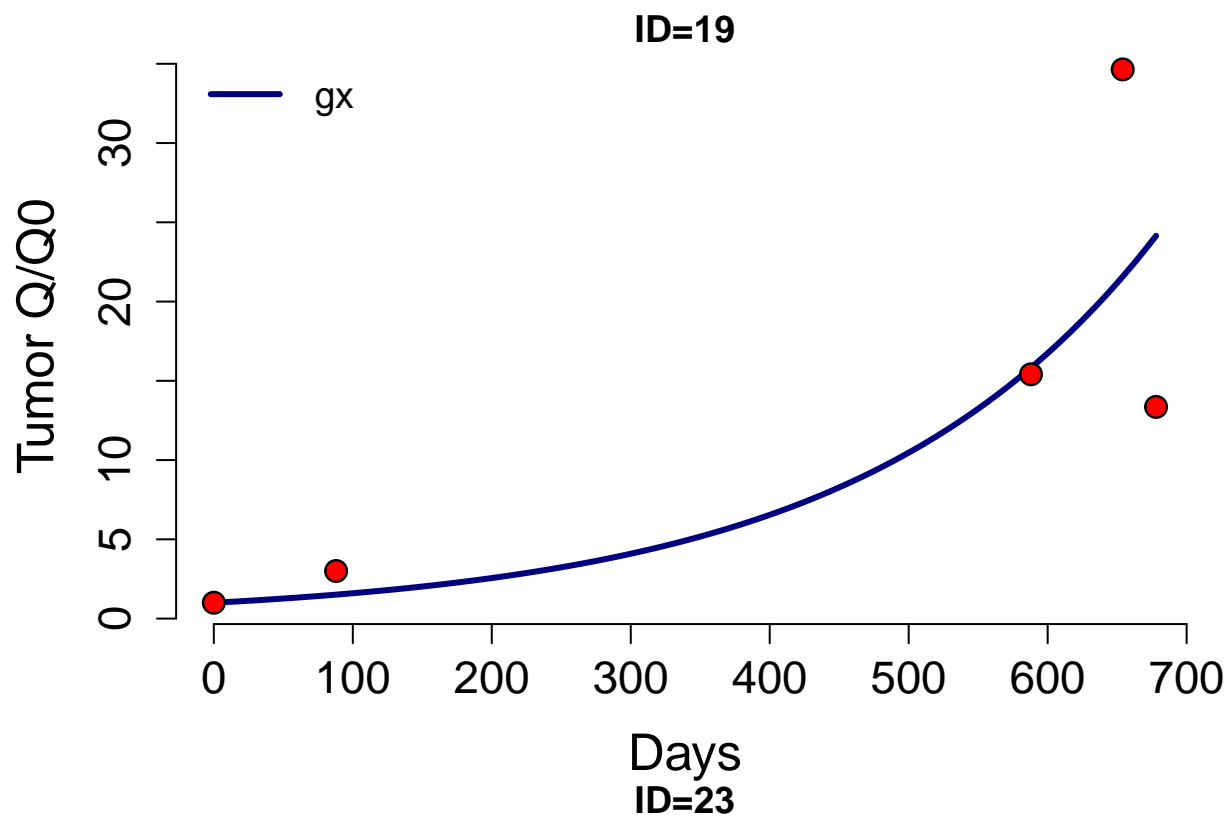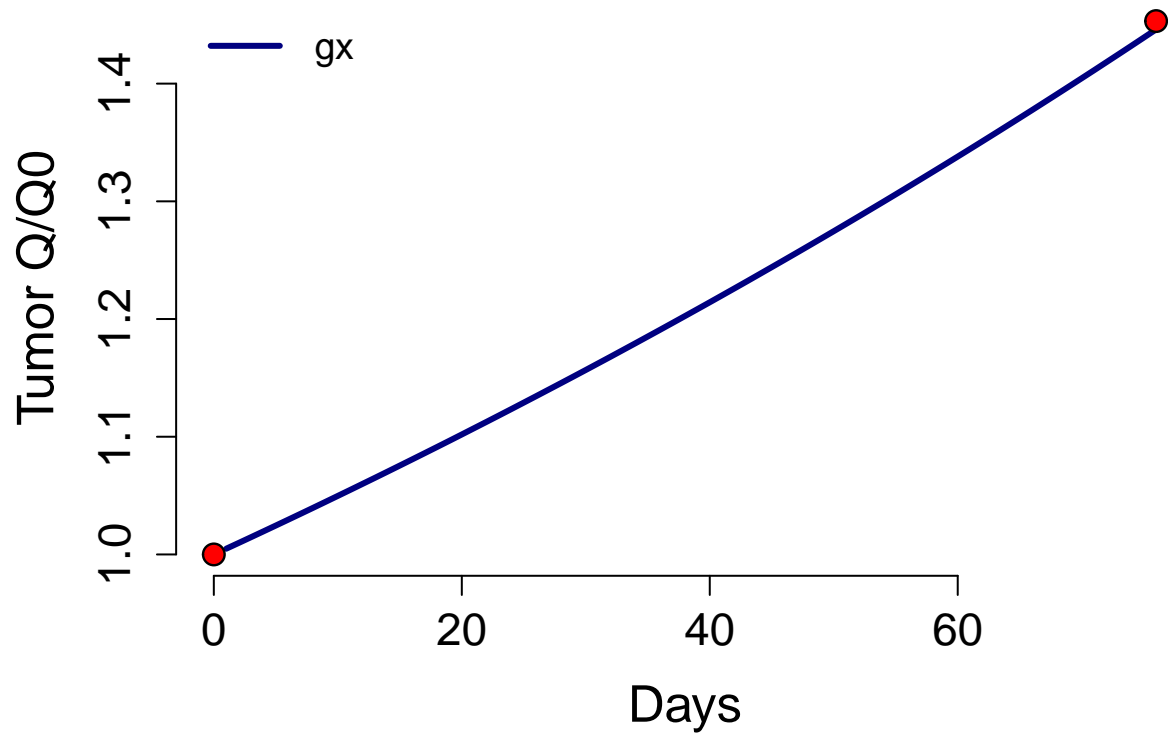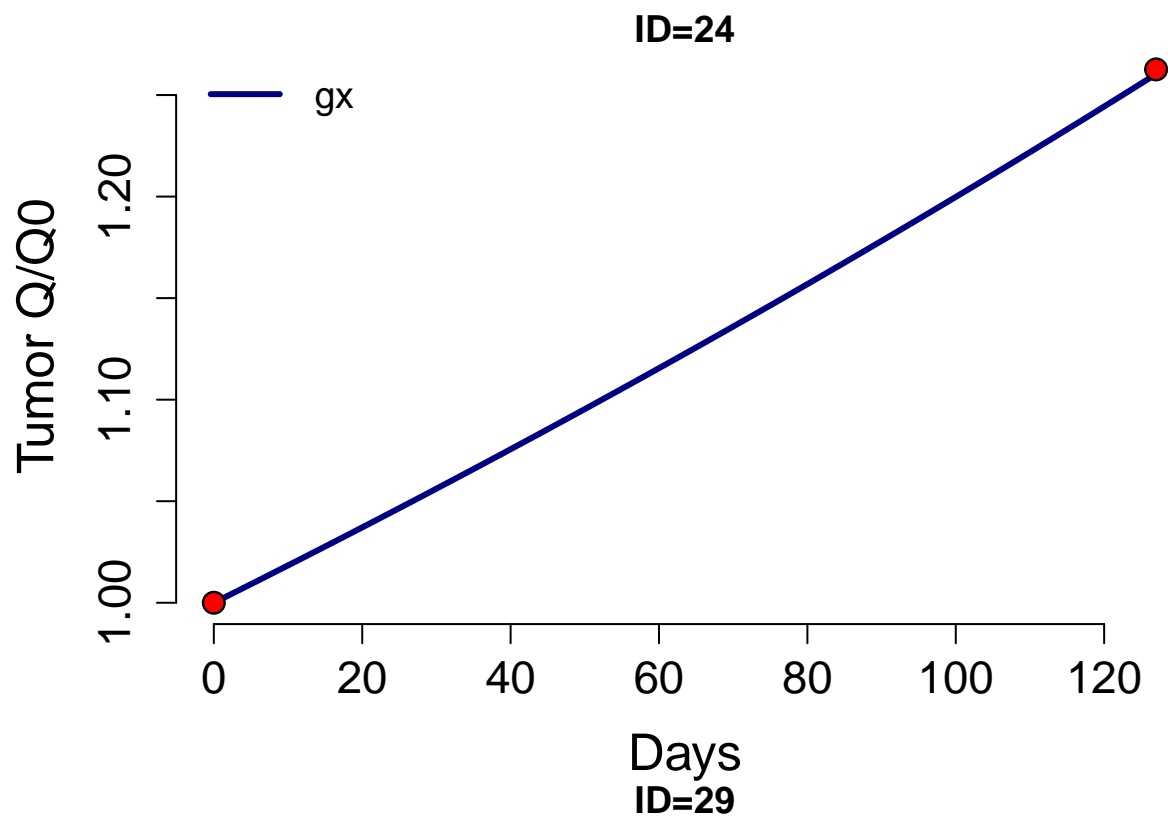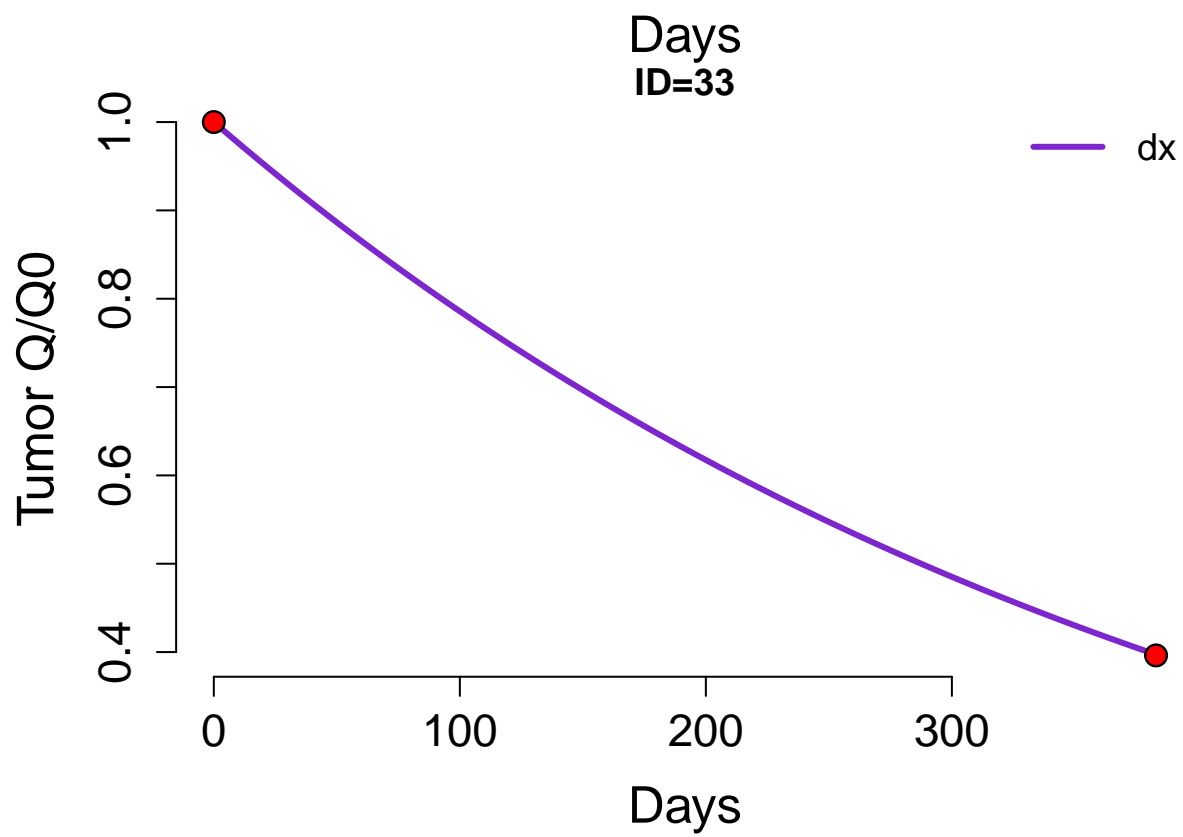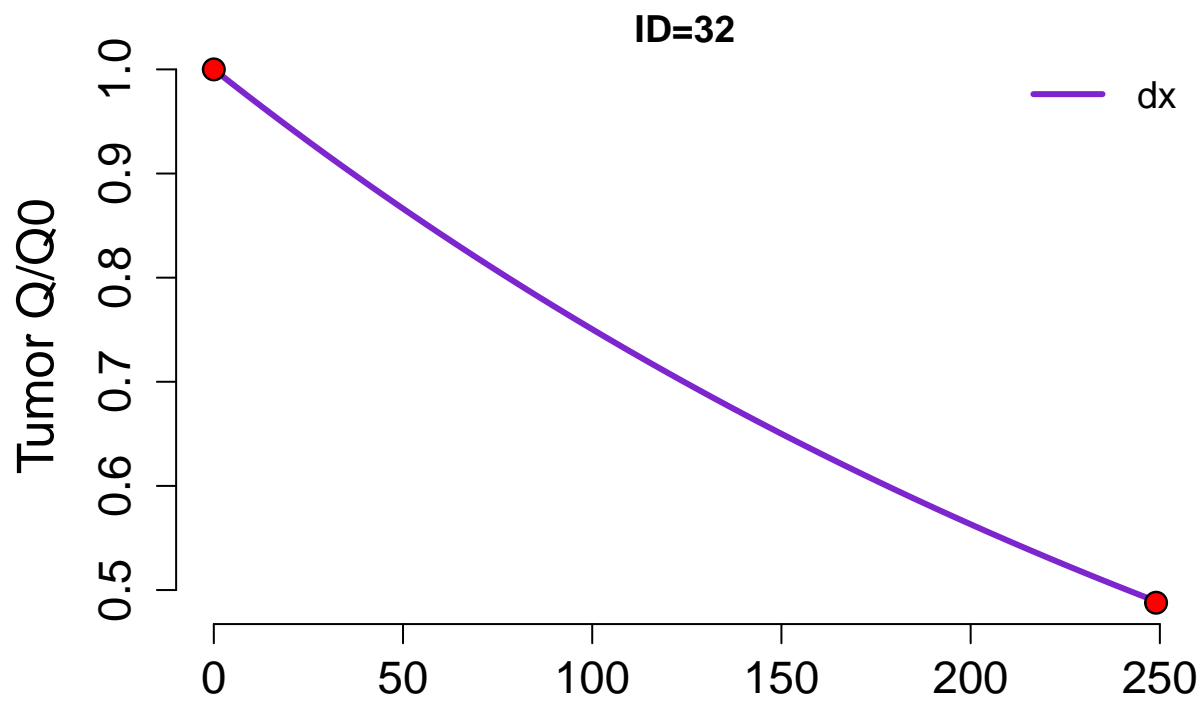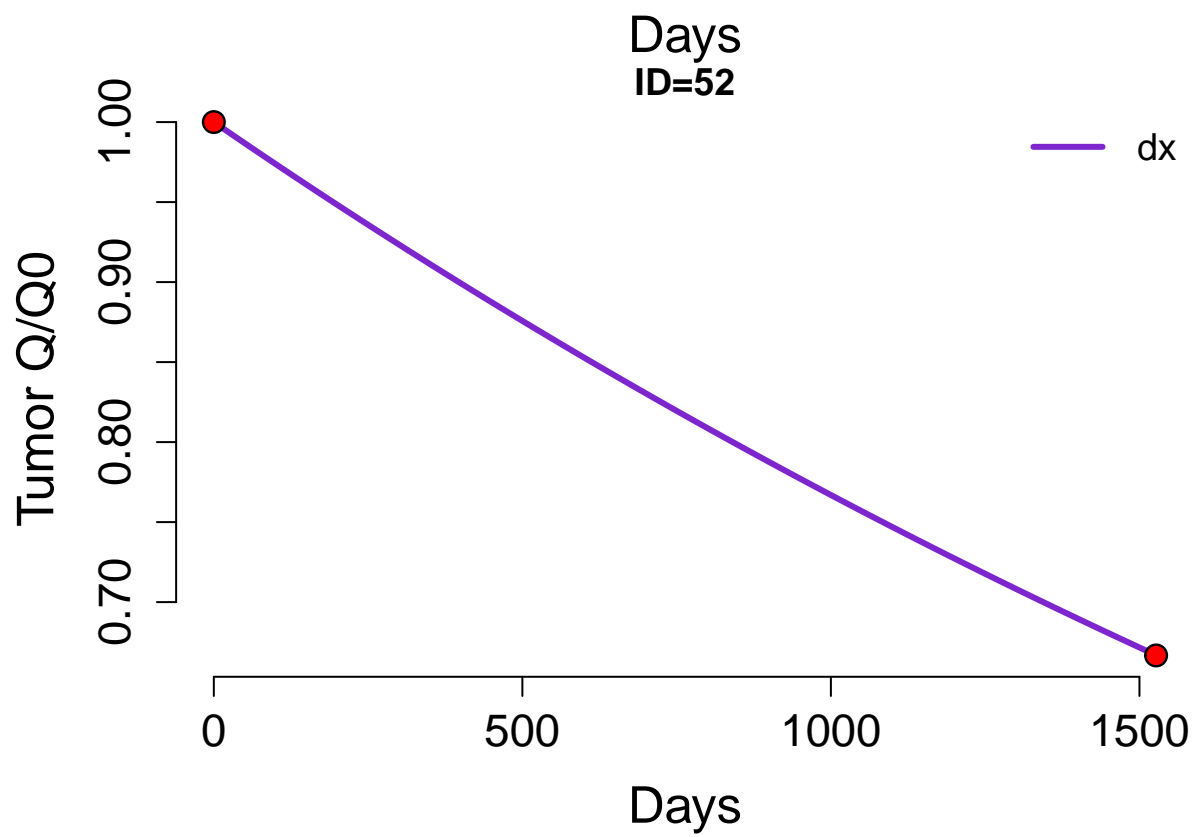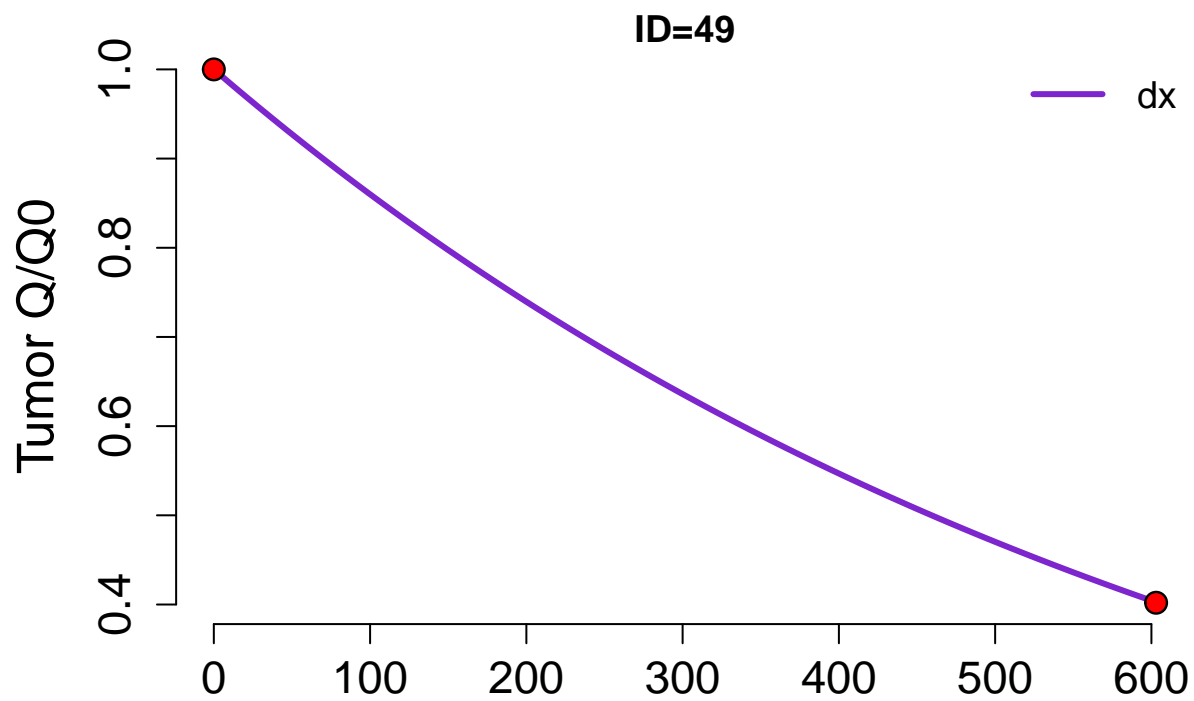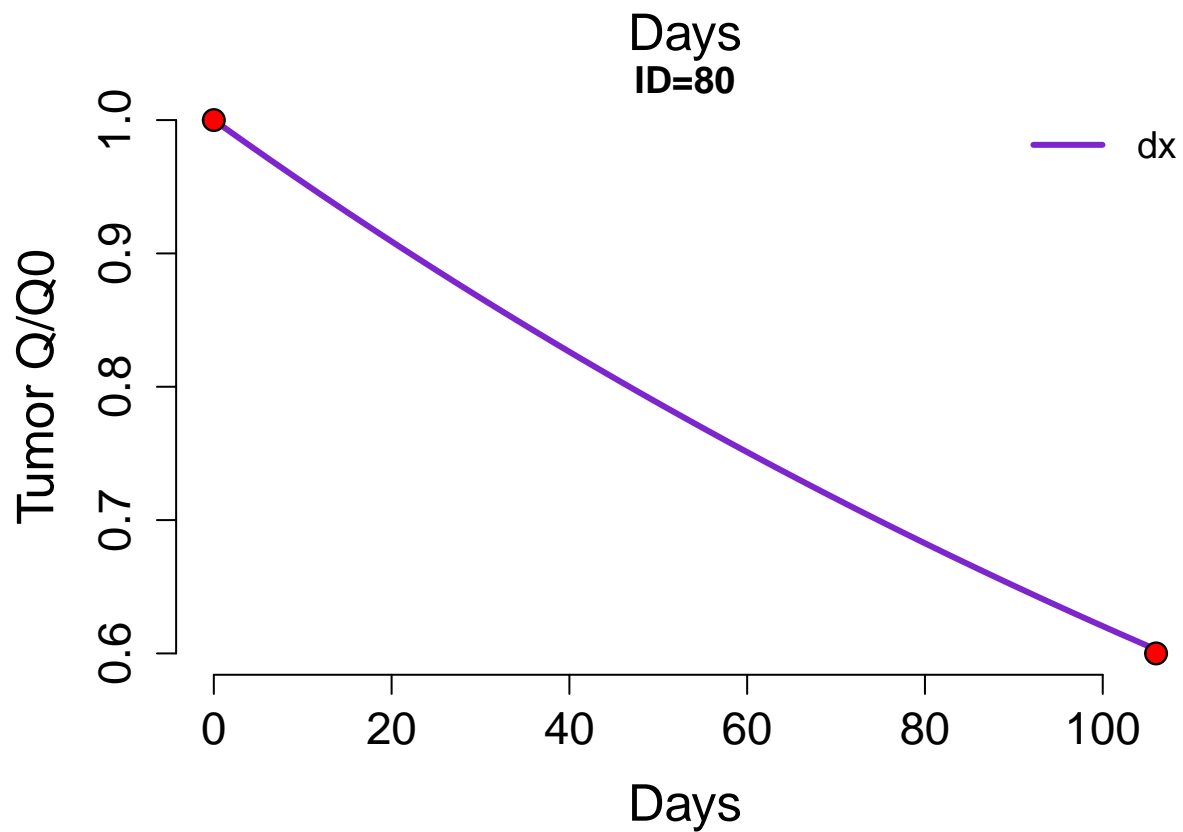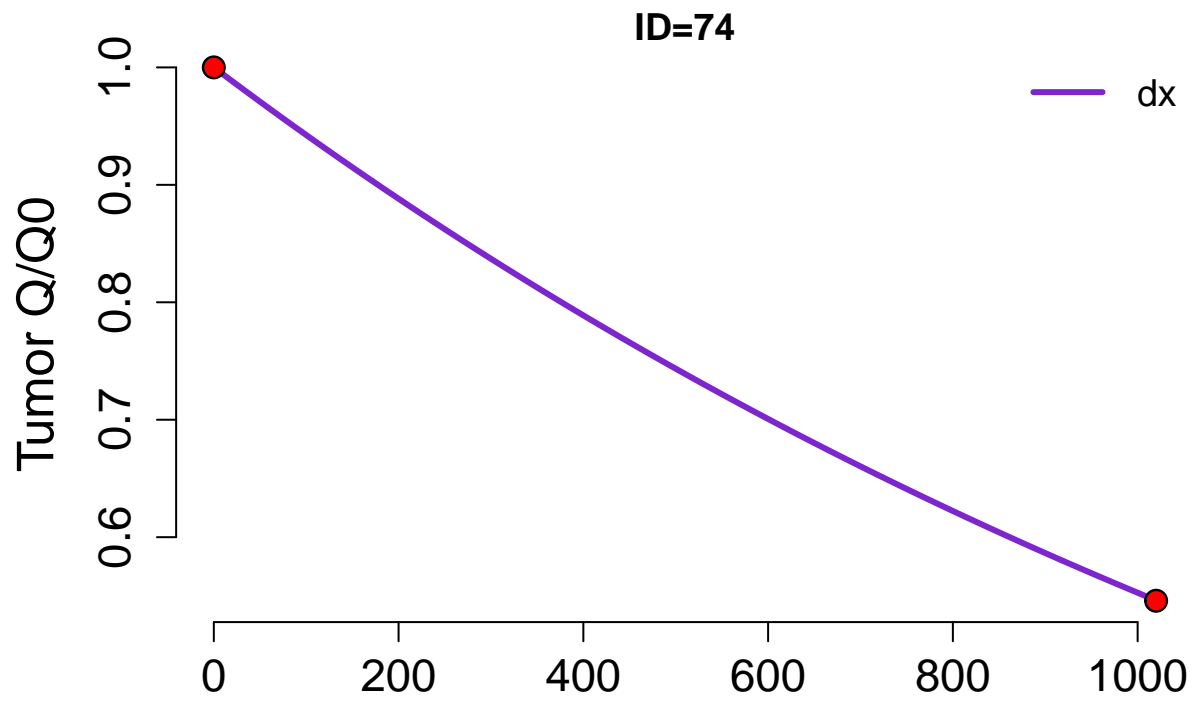
```
out_hipd_0$models
```

```
##      Group Analyzed            Type  N Percentage
## 1 excluded    no 2 evals not 20% diff  6         10
```

```
## 2 excluded       yes              not fit 17        29
## 3 included       yes                  dx 14        24
## 4 included       yes                  gd  7        12
## 5 included       yes               gdphi  1         2
## 6 included       yes                  gx 13        22
```

```
out_hipd_1$models
```

```
##      Group Analyzed                  Type N Percentage
## 1 excluded      no 2 evals not 20% diff 3         14
## 2 excluded      yes             not fit 5         23
## 3 included      yes                  dx 6         27
## 4 included      yes                  gd 2          9
## 5 included      yes                  gx 6         27
```

```r
cols_to_select = c("type", "selected", "name")

gd1 = as.data.frame(out_hipd_0$allest[cols_to_select])
gd2 = as.data.frame(out_hipd_1$allest[cols_to_select])

# delete duplicated rows
gd1 = gd1[!duplicated(gd1), ]
gd2 = gd2[!duplicated(gd2), ]


h0 = merge(sub_dataframes$HiPD_V1V2_0, gd1, by = "name", all = TRUE)
h1 = merge(sub_dataframes$HiPD_V1V2_1, gd2, by = "name", all = TRUE)


h0$date = as.Date(h0$date, origin = "1970-01-01")
h1$date = as.Date(h1$date, origin = "1970-01-01")

plot_data(h0)
```

`plot_data(h1)`

57
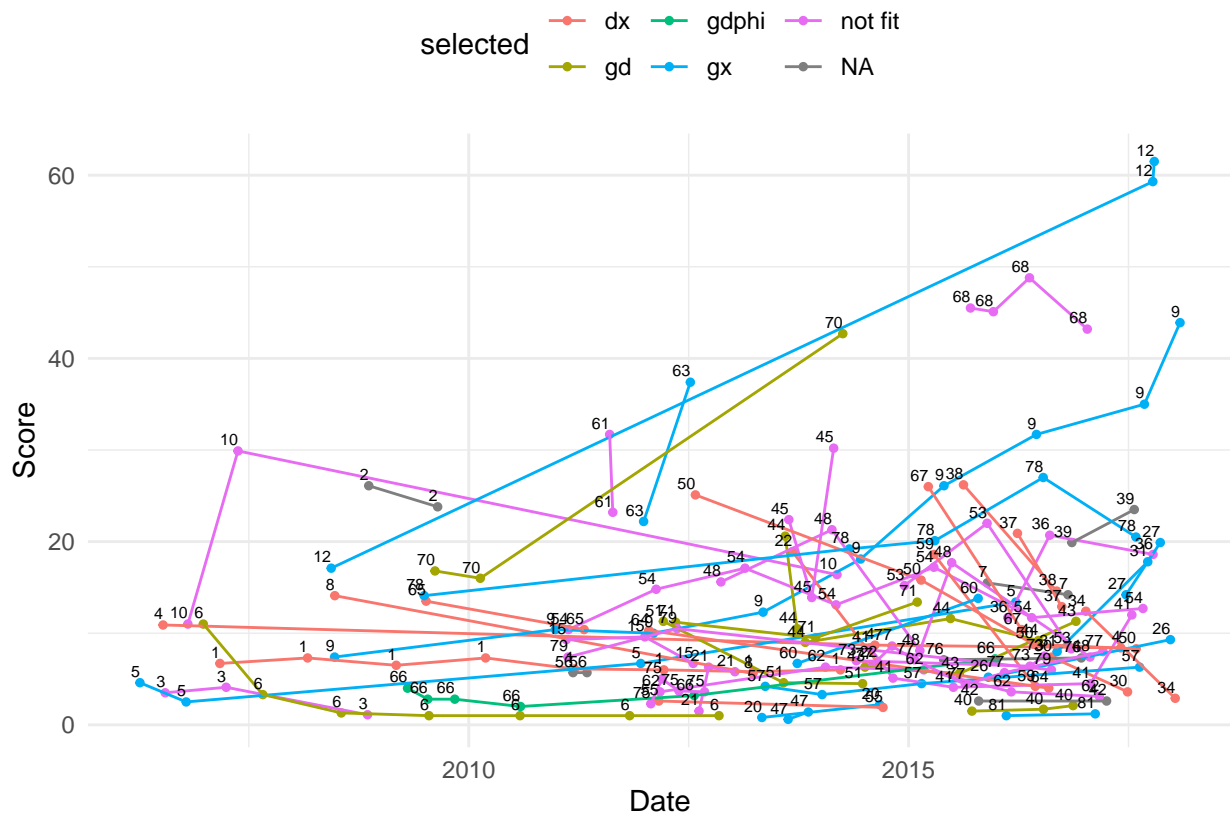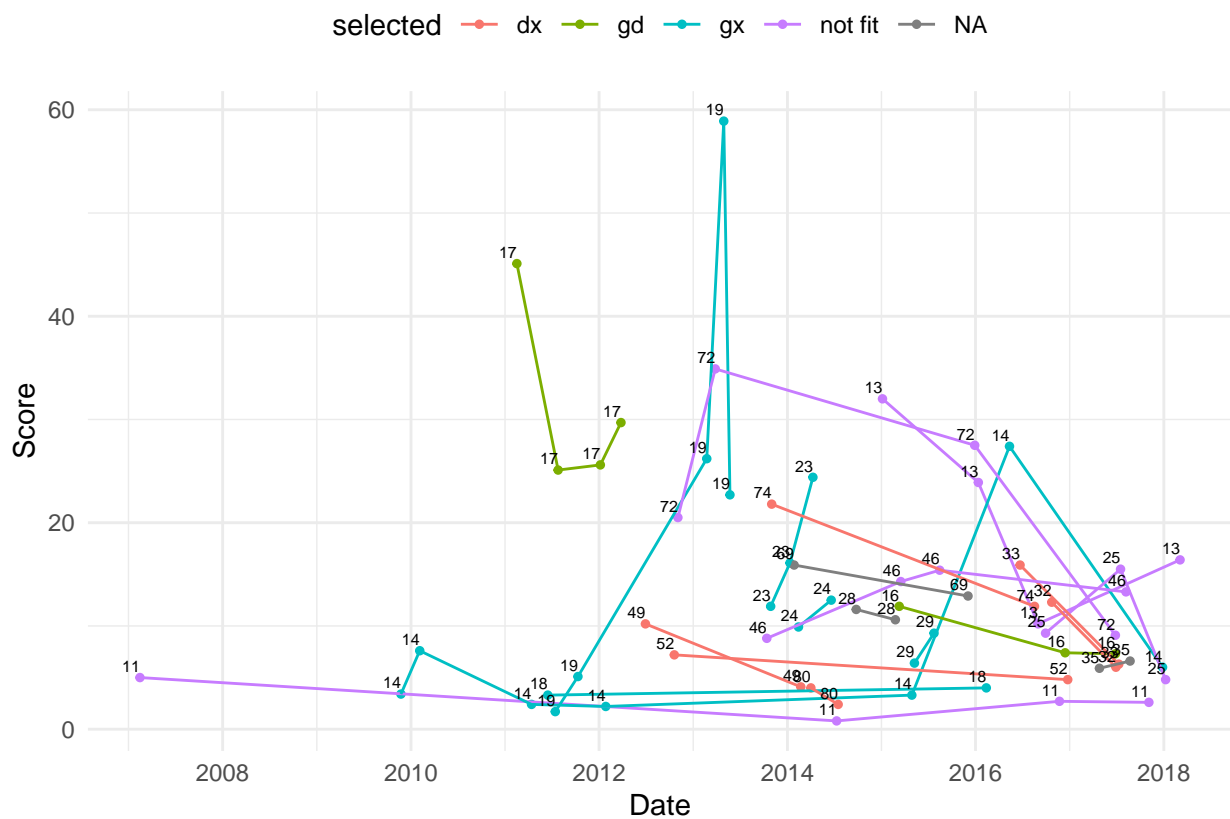
```r
# g-d-rate model for treatment CsA_V1V2

out_csa_0 = gdrate(sub_dataframes$CsA_V1V2_0, 0.05, FALSE)
out_csa_1 = gdrate(sub_dataframes$CsA_V1V2_1, 0.05, FALSE)

out_csa_0$models
```

```
##        Group Analyzed                   Type  N Percentage
## 1 excluded       no 2 evals not 20% diff  7          13
## 2 excluded      yes             not fit 14          27
## 3 included      yes                  dx 14          27
## 4 included      yes                  gd  6          12
## 5 included      yes               gdphi  1           2
## 6 included      yes                  gx 10          19
```

```r
out_csa_1$models
```

```
##        Group Analyzed                  Type N Percentage
## 1 excluded       no 2 evals not 20% diff 2           7
## 2 excluded      yes            not fit 8          29
## 3 included      yes                 dx 6          21
## 4 included      yes                 gd 3          11
## 5 included      yes                 gx 9          32
```

```r
cols_to_select = c("type", "selected", "name")

gd1 = as.data.frame(out_csa_0$allest[cols_to_select])
gd2 = as.data.frame(out_csa_1$allest[cols_to_select])

# delete duplicated rows
gd1 = gd1[!duplicated(gd1), ]
gd2 = gd2[!duplicated(gd2), ]


csa0 = merge(sub_dataframes$CsA_V1V2_0, gd1, by = "name", all = TRUE)
csa1 = merge(sub_dataframes$CsA_V1V2_1, gd2, by = "name", all = TRUE)


csa0$date = as.Date(csa0$date, origin = "1970-01-01")
csa1$date = as.Date(csa1$date, origin = "1970-01-01")

plot_data(csa0)
```

`plot_data(csa1)`

59
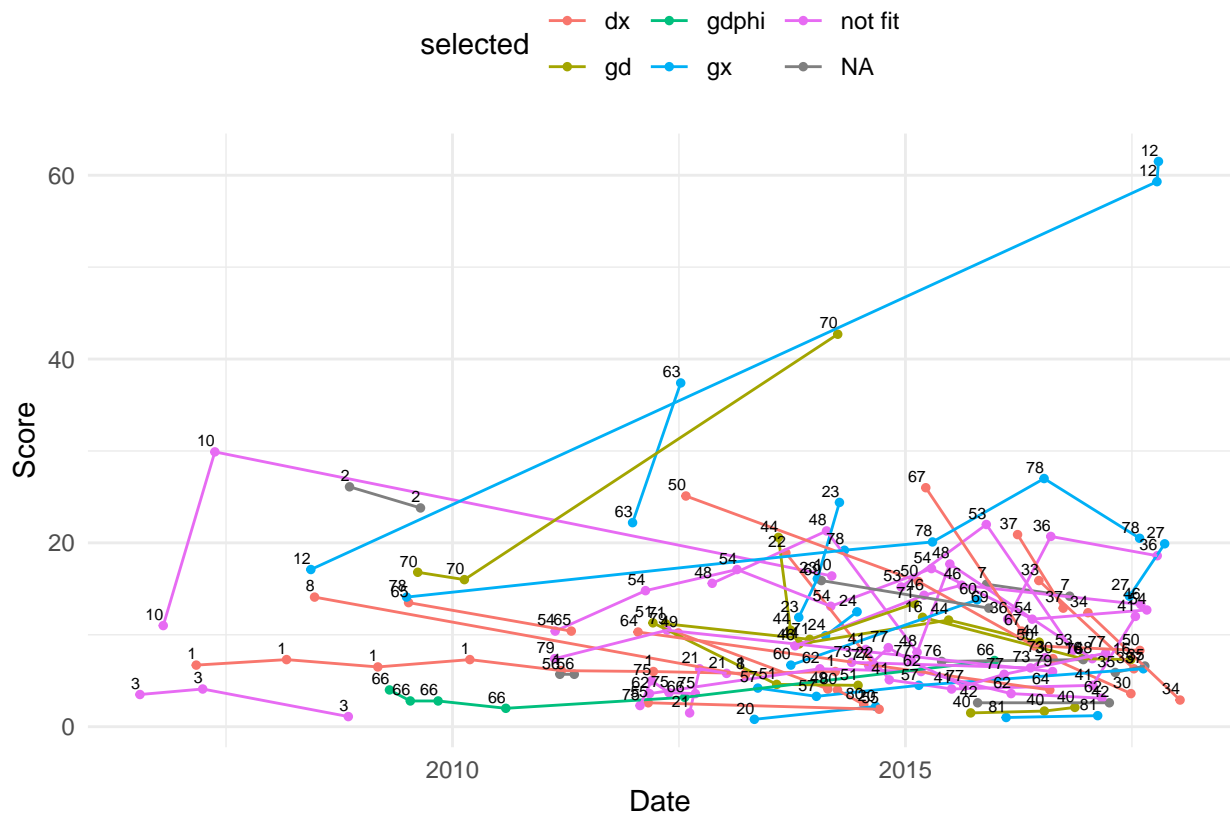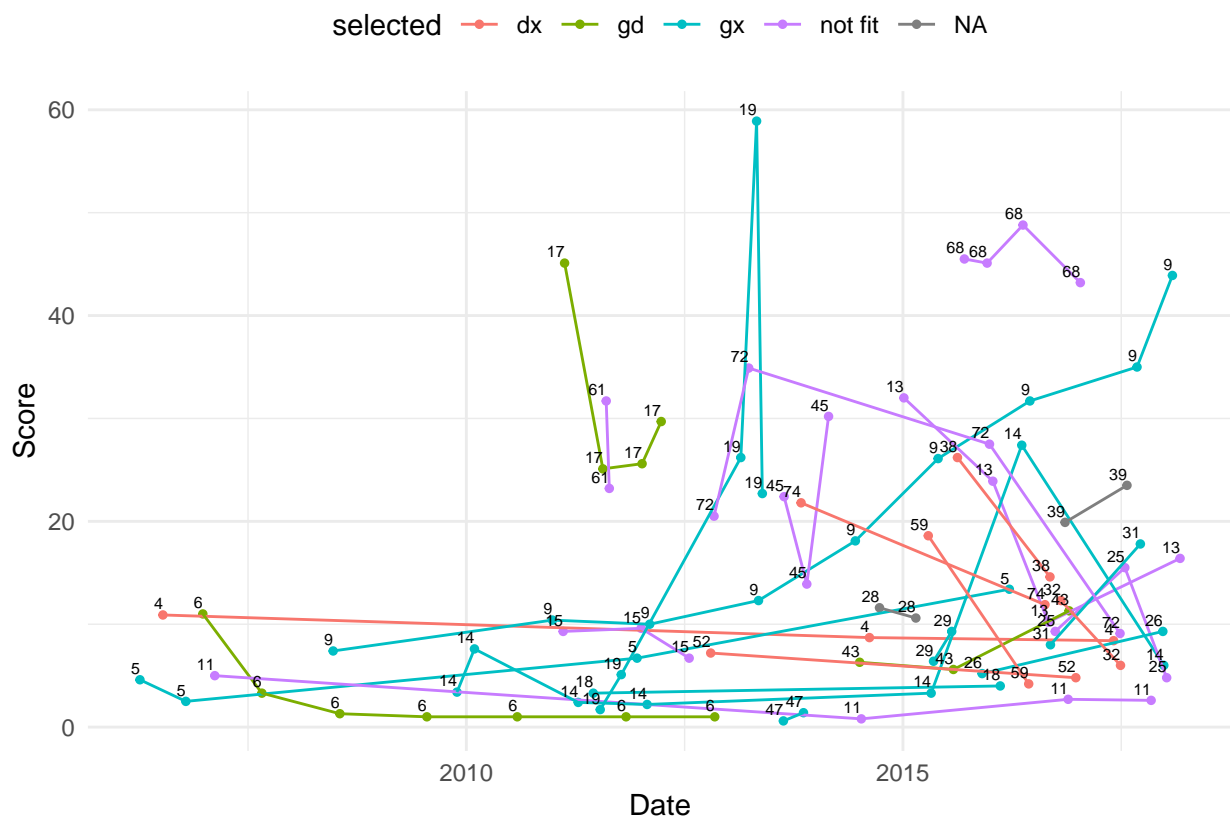
```r
# g-d-rate model for treatment CTX_V1V2

out_ctx_0 = gdrate(sub_dataframes$CTX_V1V2_0, 0.05, FALSE)
out_ctx_1 = gdrate(sub_dataframes$CTX_V1V2_1, 0.05, FALSE)

out_ctx_0$models
```

```
##       Group Analyzed                 Type  N Percentage
## 1 excluded       no 2 evals not 20% diff  6          8
## 2 excluded      yes              not fit 20         27
## 3 included      yes                   dx 20         27
## 4 included      yes                   gd  8         11
## 5 included      yes                gdphi  1          1
## 6 included      yes                   gx 18         25
```

```r
out_ctx_1$models
```

```
##       Group Analyzed                 Type N Percentage
## 1 excluded       no 2 evals not 20% diff 3         43
## 2 excluded      yes              not fit 2         29
## 3 included      yes                   gd 1         14
## 4 included      yes                   gx 1         14
```

```r
cols_to_select = c("type", "selected", "name")

gd1 = as.data.frame(out_ctx_0$allest[cols_to_select])
gd2 = as.data.frame(out_ctx_1$allest[cols_to_select])

# delete duplicated rows
gd1 = gd1[!duplicated(gd1), ]
gd2 = gd2[!duplicated(gd2), ]


h0 = merge(sub_dataframes$CTX_V1V2_0, gd1, by = "name", all = TRUE)
h1 = merge(sub_dataframes$CTX_V1V2_1, gd2, by = "name", all = TRUE)


h0$date = as.Date(h0$date, origin = "1970-01-01")
h1$date = as.Date(h1$date, origin = "1970-01-01")

plot_data(h0)
```
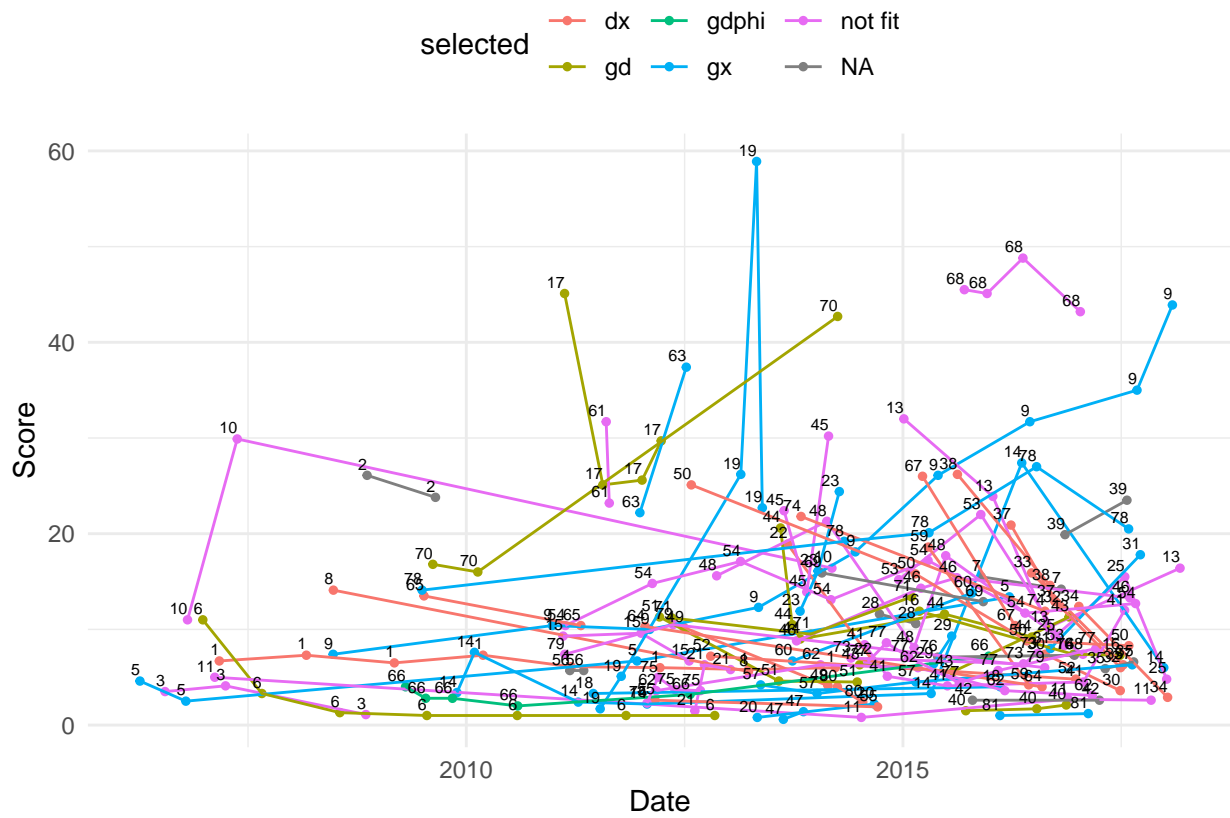
plot_data(h1)

61
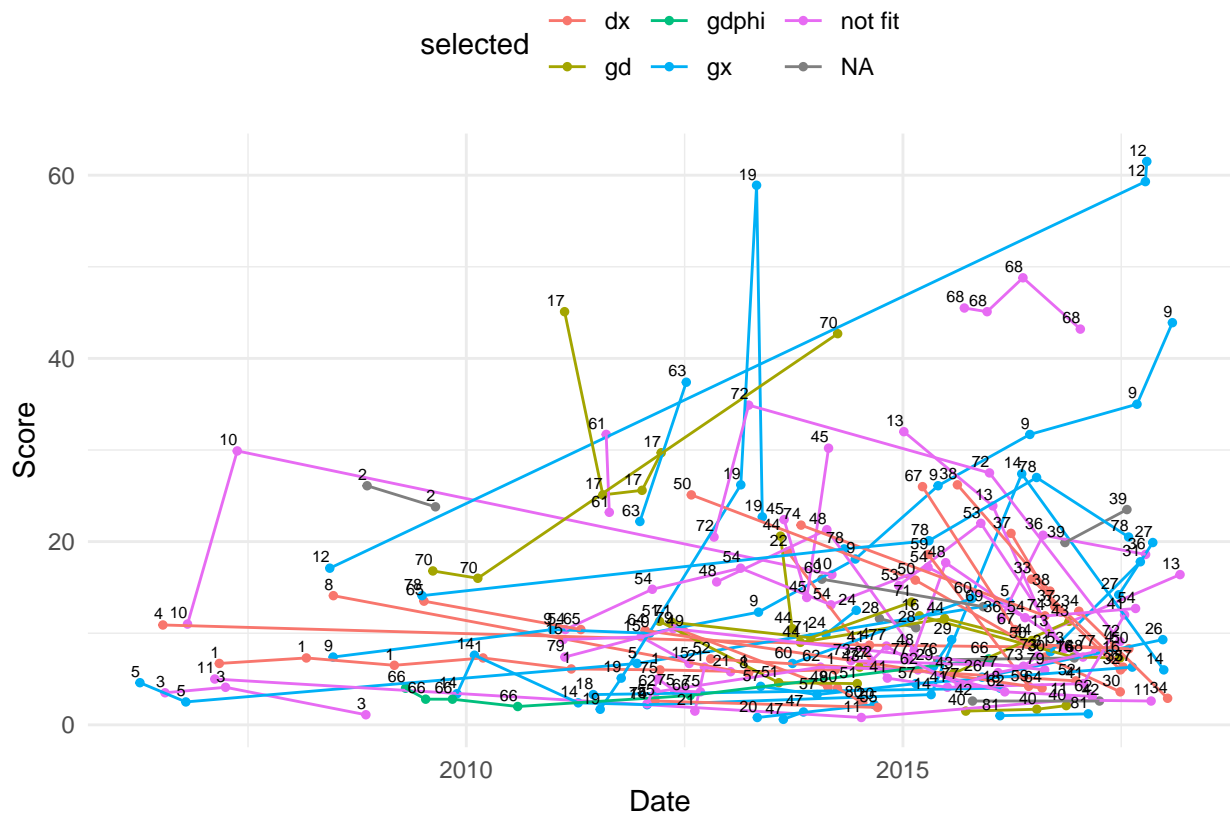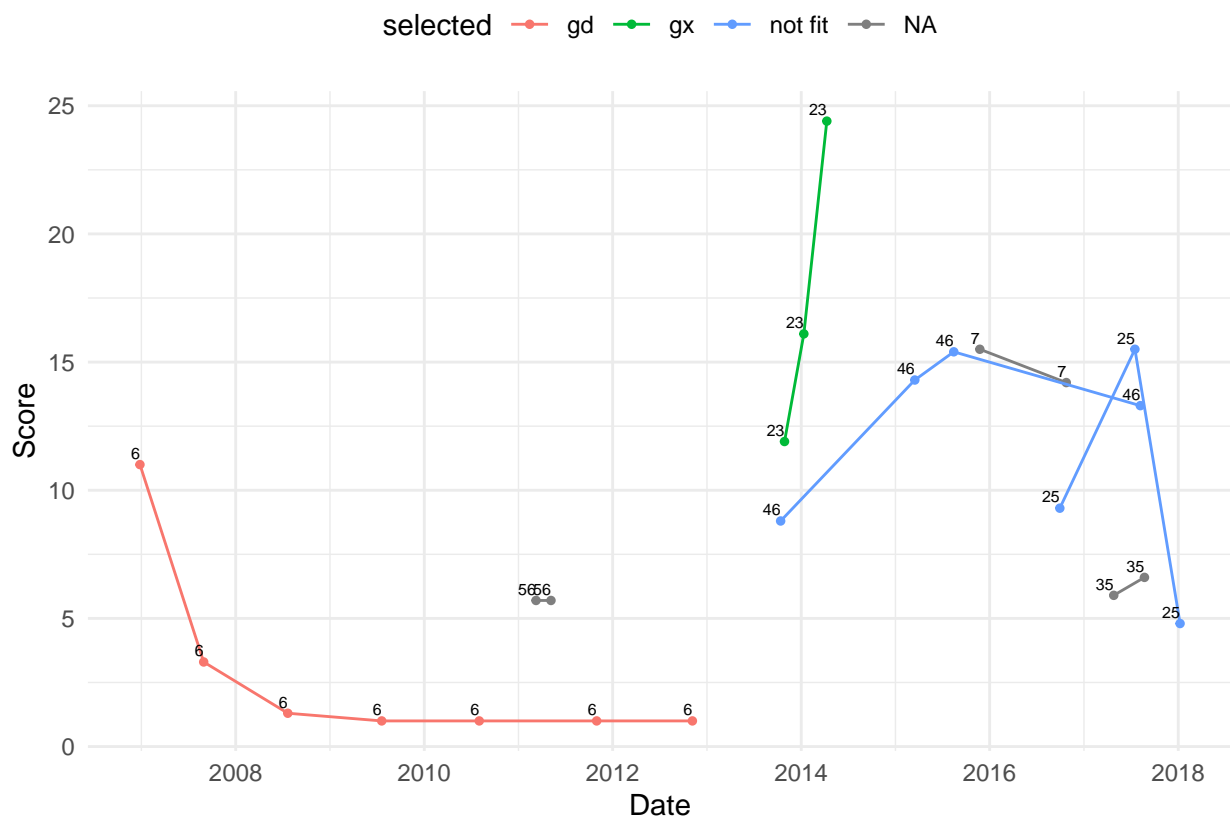
```r
# g-d-rate model for treatment azt_V1V2

out_azt_0 = gdrate(sub_dataframes$AZT_V1V2_0, 0.05, FALSE)
out_azt_1 = gdrate(sub_dataframes$AZT_V1V2_1, 0.05, FALSE)

out_azt_0$models
```

```
##       Group Analyzed                 Type  N Percentage
## 1 excluded       no 2 evals not 20% diff  8         14
## 2 excluded      yes               not fit 15         25
## 3 included      yes                    dx 13         22
## 4 included      yes                    gd  7         12
## 5 included      yes                    gx 16         27
```

```r
out_azt_1$models
```

```
##       Group Analyzed                 Type N Percentage
## 1 excluded       no 2 evals not 20% diff 1          5
## 2 excluded      yes               not fit 7         33
## 3 included      yes                    dx 7         33
## 4 included      yes                    gd 2         10
## 5 included      yes                 gdphi 1          5
## 6 included      yes                    gx 3         14
```

```r
cols_to_select = c("type", "selected", "name")

gd1 = as.data.frame(out_azt_0$allest[cols_to_select])
gd2 = as.data.frame(out_azt_1$allest[cols_to_select])

# delete duplicated rows
gd1 = gd1[!duplicated(gd1), ]
gd2 = gd2[!duplicated(gd2), ]


h0 = merge(sub_dataframes$AZT_V1V2_0, gd1, by = "name", all = TRUE)
h1 = merge(sub_dataframes$AZT_V1V2_1, gd2, by = "name", all = TRUE)


h0$date = as.Date(h0$date, origin = "1970-01-01")
h1$date = as.Date(h1$date, origin = "1970-01-01")

plot_data(h0)
```
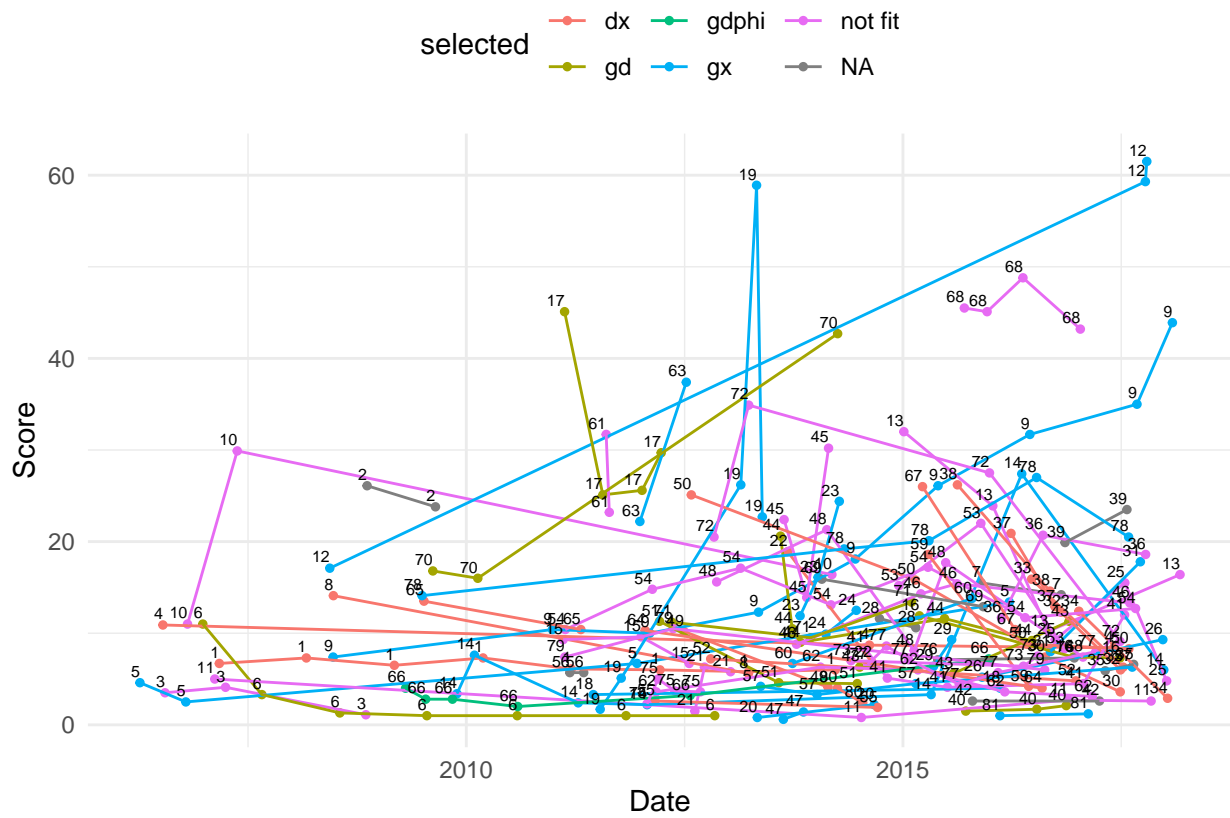
```
plot_data(h1)
```


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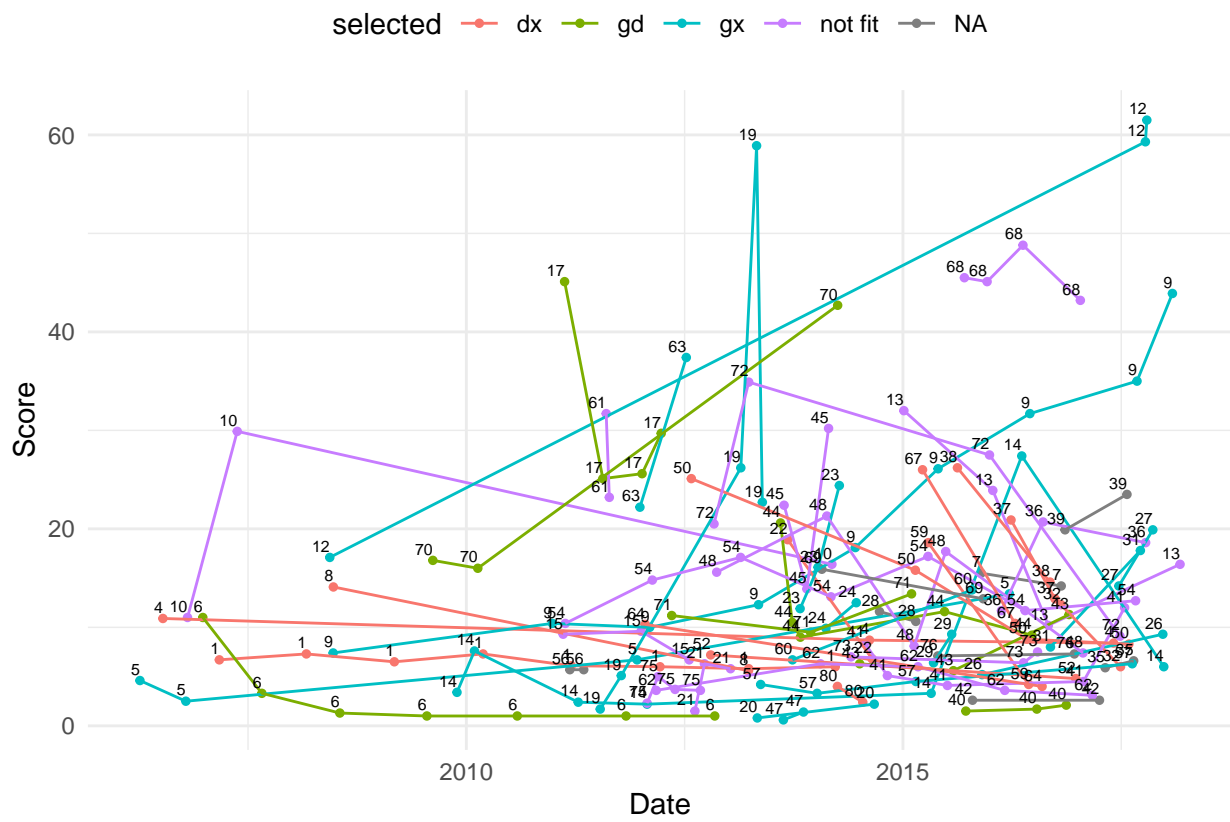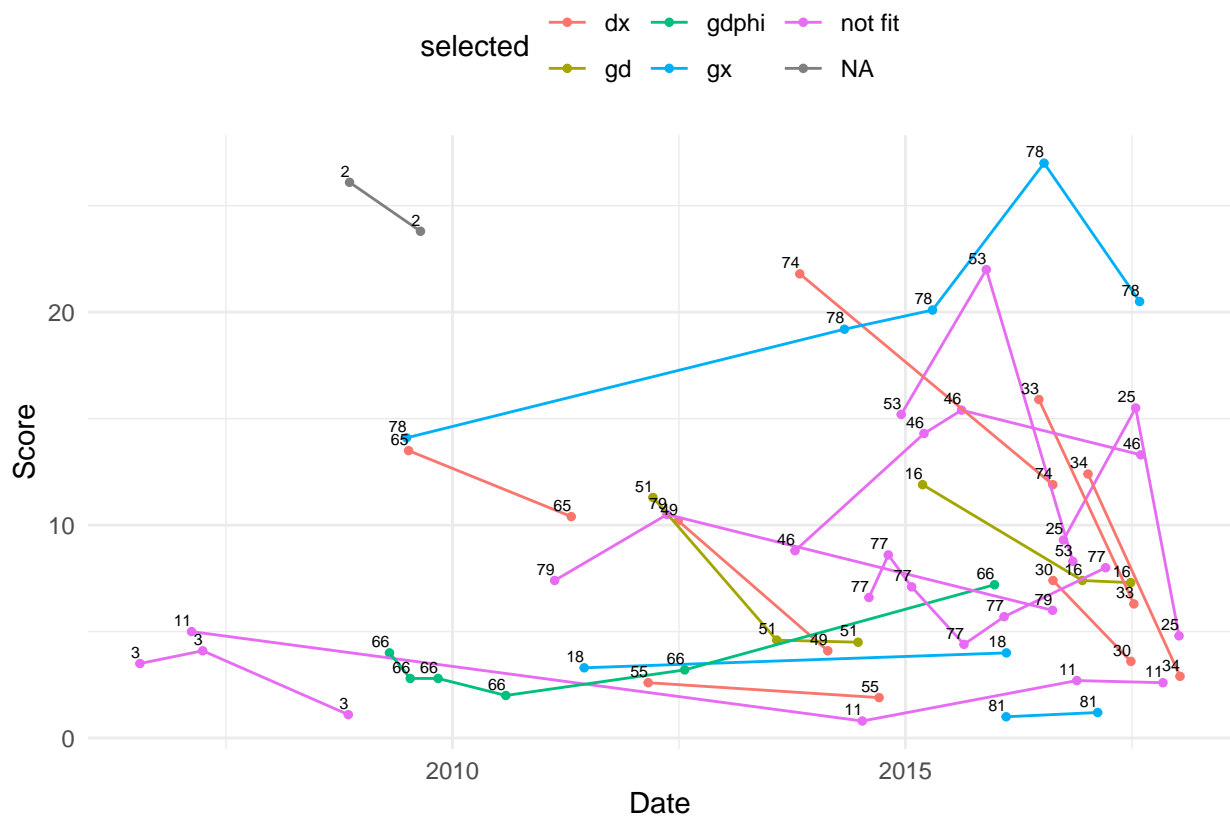
```
# g-d-rate model for treatment tac_V1V2

out_tac_0 = gdrate(sub_dataframes$Tac_V1V2_0, 0.05, FALSE)
out_tac_1 = gdrate(sub_dataframes$Tac_V1V2_1, 0.05, FALSE)

out_tac_0$models
```

```
##       Group Analyzed               Type  N Percentage
## 1 excluded       no 2 evals not 20% diff  9         12
## 2 excluded      yes              not fit 20         27
## 3 included      yes                   dx 19         26
## 4 included      yes                   gd  9         12
## 5 included      yes                gdphi  1          1
## 6 included      yes                   gx 15         21
```

```
out_tac_1$models
```

```
##       Group Analyzed    Type N Percentage
## 1 excluded      yes not fit 2         29
## 2 included      yes      dx 1         14
## 3 included      yes      gx 4         57
```

```
cols_to_select = c("type", "selected", "name")

gd1 = as.data.frame(out_tac_0$allest[cols_to_select])
gd2 = as.data.frame(out_tac_1$allest[cols_to_select])

# delete duplicated rows
gd1 = gd1[!duplicated(gd1), ]
gd2 = gd2[!duplicated(gd2), ]


h0 = merge(sub_dataframes$Tac_V1V2_0, gd1, by = "name", all = TRUE)
h1 = merge(sub_dataframes$Tac_V1V2_1, gd2, by = "name", all = TRUE)


h0$date = as.Date(h0$date, origin = "1970-01-01")
h1$date = as.Date(h1$date, origin = "1970-01-01")

plot_data(h0)
```

`plot_data(h1)`
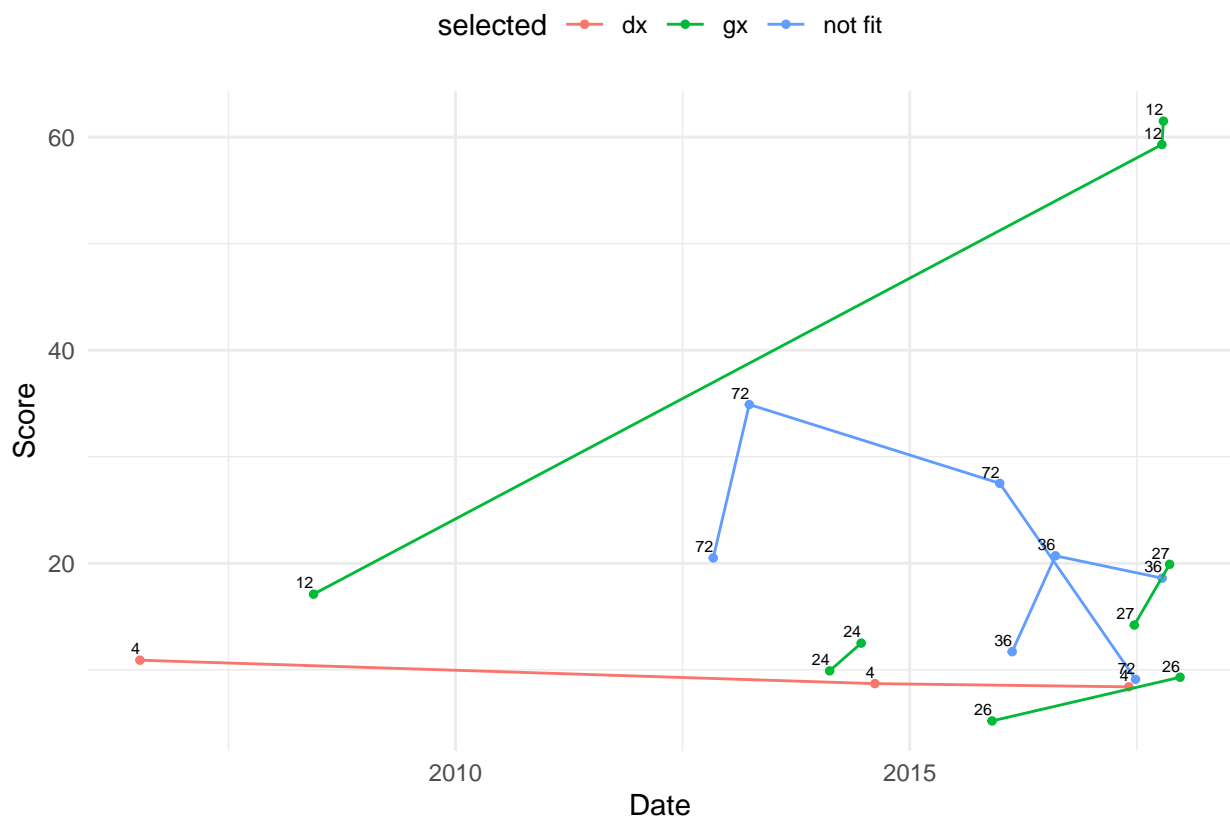
```r
# g-d-rate model for treatment MMF_V1V2

out_mmf_0 = gdrate(sub_dataframes$MMF_V1V2_0, 0.05, FALSE)
out_mmf_1 = gdrate(sub_dataframes$MMF_V1V2_1, 0.05, FALSE)

out_mmf_0$models
```

```
##       Group Analyzed               Type  N Percentage
## 1 excluded      no 2 evals not 20% diff  9         12
## 2 excluded     yes            not fit   22         28
## 3 included     yes                 dx   19         24
## 4 included     yes                 gd    9         12
## 5 included     yes              gdphi    1          1
## 6 included     yes                 gx   18         23
```

```r
out_mmf_1$models
```

```
##       Group Analyzed Type N Percentage
## 1 included     yes   dx 1         50
## 2 included     yes   gx 1         50
```

```r
cols_to_select = c("type", "selected", "name")

gd1 = as.data.frame(out_mmf_0$allest[cols_to_select])
gd2 = as.data.frame(out_mmf_1$allest[cols_to_select])

# delete duplicated rows
gd1 = gd1[!duplicated(gd1), ]
gd2 = gd2[!duplicated(gd2), ]


h0 = merge(sub_dataframes$MMF_V1V2_0, gd1, by = "name", all = TRUE)
h1 = merge(sub_dataframes$MMF_V1V2_1, gd2, by = "name", all = TRUE)


h0$date = as.Date(h0$date, origin = "1970-01-01")
h1$date = as.Date(h1$date, origin = "1970-01-01")

plot_data(h0)
```
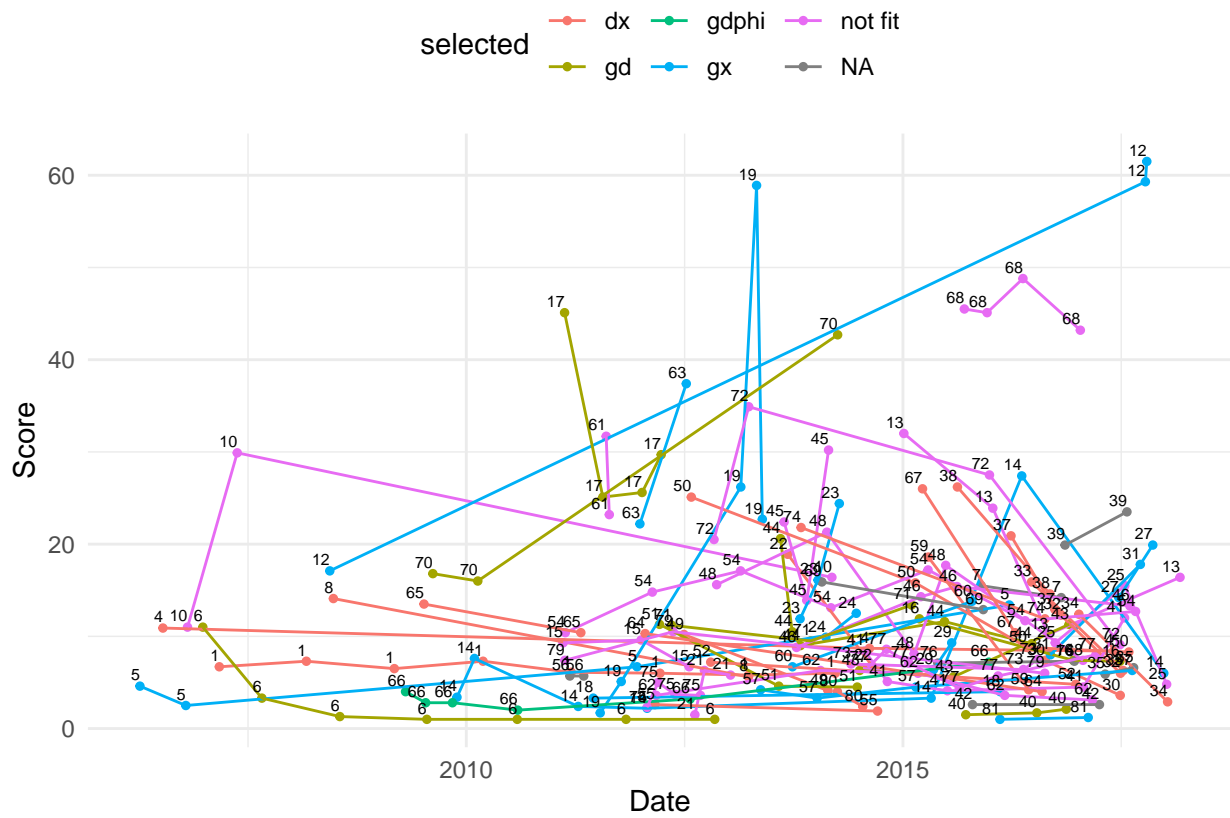
```
plot_data(h1)
```


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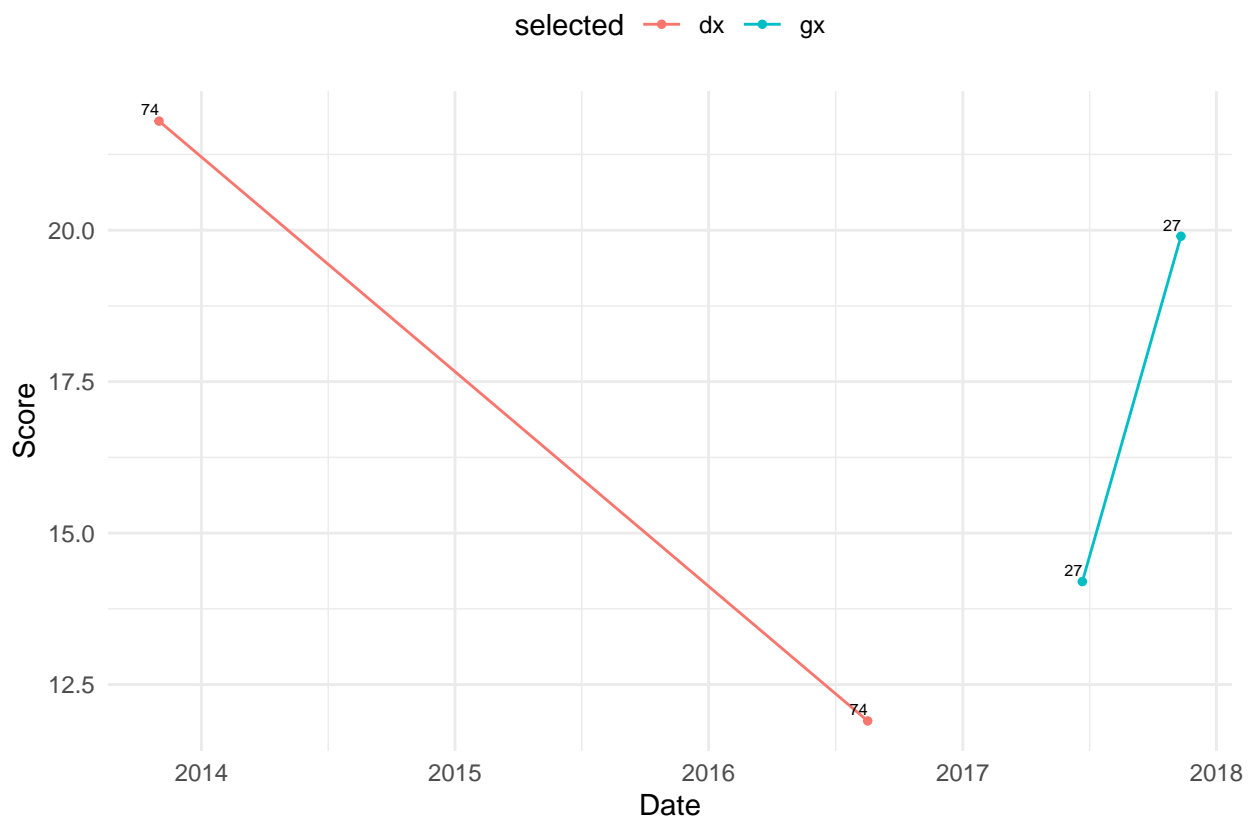
```r
# g-d-rate model for treatment MTX_V1V2

out_mtx_0 = gdrate(sub_dataframes$MTX_V1V2_0, 0.05, FALSE)
out_mtx_1 = gdrate(sub_dataframes$MTX_V1V2_1, 0.05, FALSE)

out_mtx_0$models
```

```
##        Group Analyzed                Type  N Percentage
## 1 excluded       no 2 evals not 20% diff  7         10
## 2 excluded      yes             not fit   18         26
## 3 included      yes                  dx   20         29
## 4 included      yes                  gd    9         13
## 5 included      yes               gdphi    1          1
## 6 included      yes                  gx   14         20
```

```r
out_mtx_1$models
```

```
##        Group Analyzed               Type N Percentage
## 1 excluded       no 2 evals not 20% diff 2         18
## 2 excluded      yes            not fit   4         36
## 3 included      yes                 gx   5         45
```

```r
cols_to_select = c("type", "selected", "name")

gd1 = as.data.frame(out_mtx_0$allest[cols_to_select])
gd2 = as.data.frame(out_mtx_1$allest[cols_to_select])

# delete duplicated rows
gd1 = gd1[!duplicated(gd1), ]
gd2 = gd2[!duplicated(gd2), ]


h0 = merge(sub_dataframes$MTX_V1V2_0, gd1, by = "name", all = TRUE)
h1 = merge(sub_dataframes$MTX_V1V2_1, gd2, by = "name", all = TRUE)


h0$date = as.Date(h0$date, origin = "1970-01-01")
h1$date = as.Date(h1$date, origin = "1970-01-01")

plot_data(h0)
```
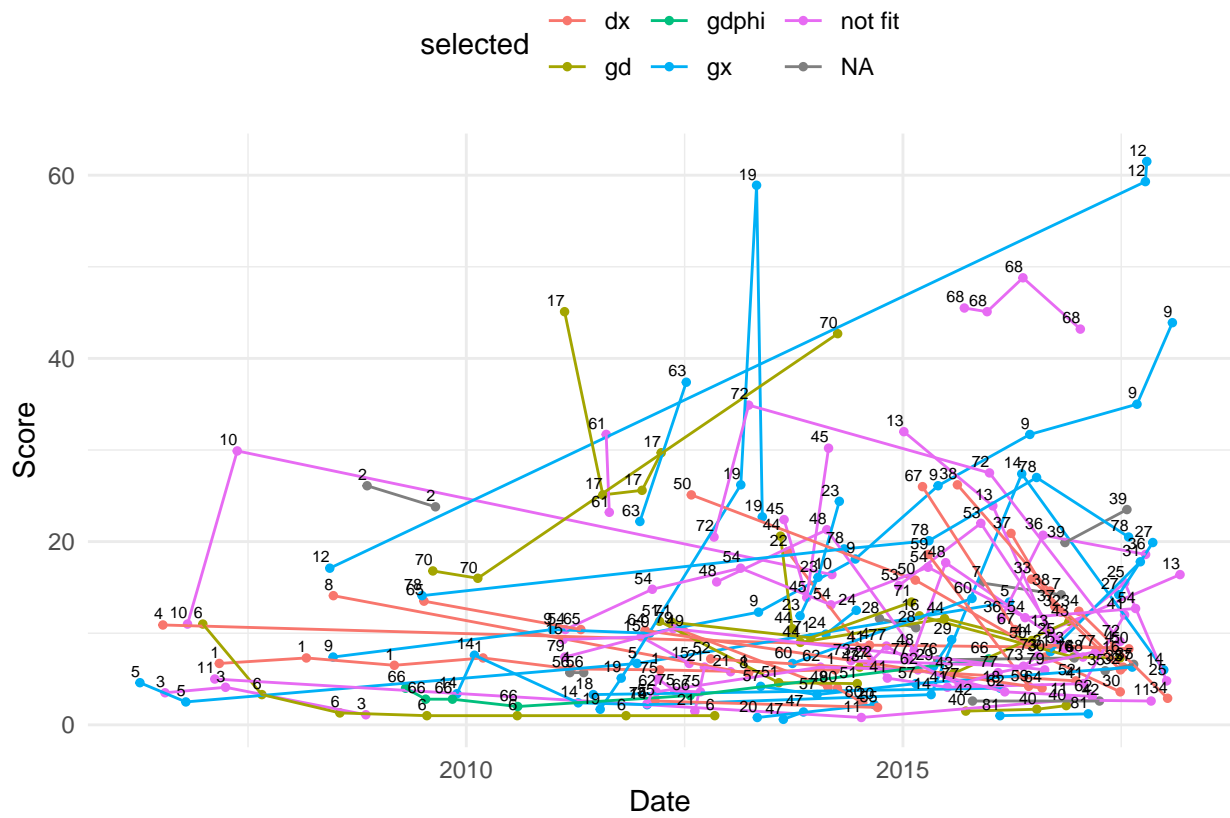
plot_data(h1)

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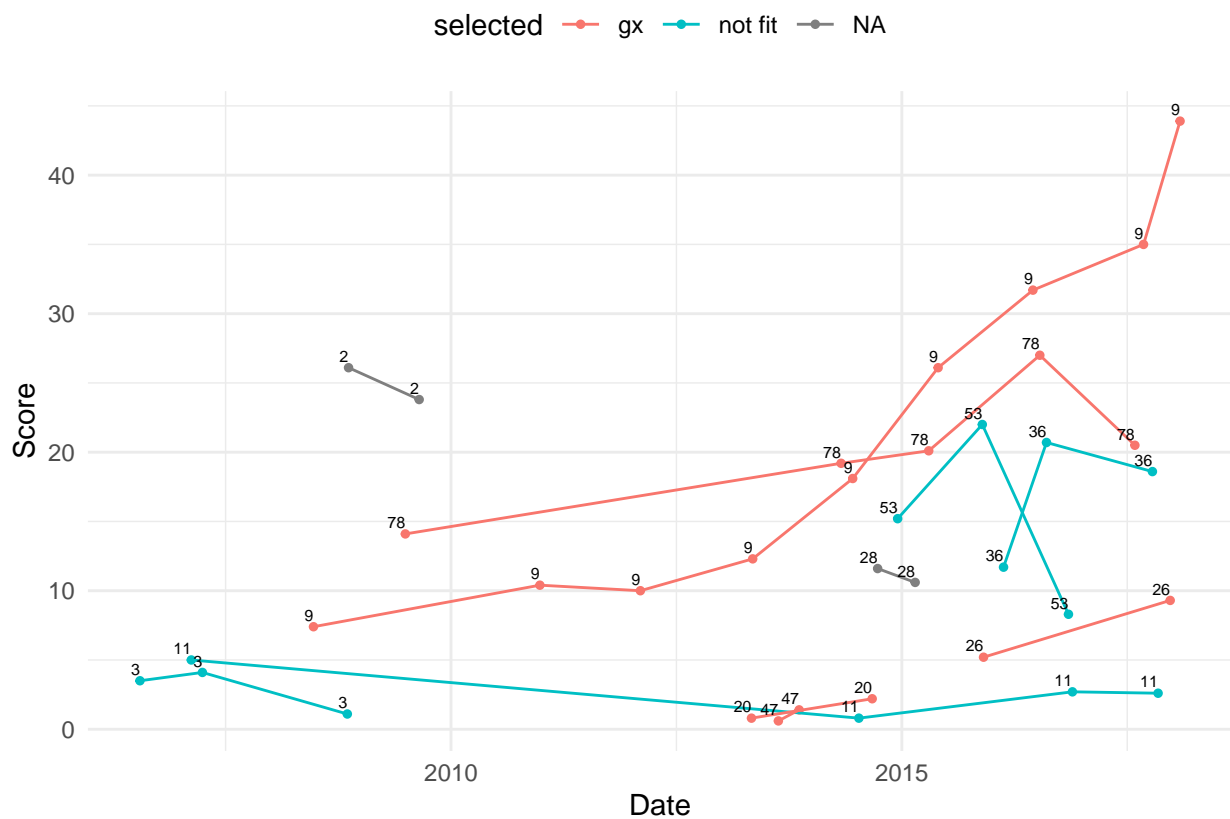
```
# g-d-rate model for treatment IVI_V1V2

out_ivi_0 = gdrate(sub_dataframes$IVIg_V1V2_0, 0.05, FALSE)
out_ivi_1 = gdrate(sub_dataframes$IVIg_V1V2_1, 0.05, FALSE)

out_ivi_0$models
```

```
##      Group Analyzed                    Type  N Percentage
## 1 excluded       no 2 evals not 20% diff  8         11
## 2 excluded      yes              not fit 21         28
## 3 included      yes                   dx 19         25
## 4 included      yes                   gd  9         12
## 5 included      yes                gdphi  1          1
## 6 included      yes                   gx 18         24
```

```
out_ivi_1$models
```

```
##      Group Analyzed                    Type N Percentage
## 1 excluded       no 2 evals not 20% diff 1         25
## 2 excluded      yes              not fit 1         25
## 3 included      yes                   dx 1         25
## 4 included      yes                   gx 1         25
```

```
cols_to_select = c("type", "selected", "name")

gd1 = as.data.frame(out_ivi_0$allest[cols_to_select])
gd2 = as.data.frame(out_ivi_1$allest[cols_to_select])

# delete duplicated rows
gd1 = gd1[!duplicated(gd1), ]
gd2 = gd2[!duplicated(gd2), ]


h0 = merge(sub_dataframes$IVIg_V1V2_0, gd1, by = "name", all = TRUE)
h1 = merge(sub_dataframes$IVIg_V1V2_1, gd2, by = "name", all = TRUE)


h0$date = as.Date(h0$date, origin = "1970-01-01")
h1$date = as.Date(h1$date, origin = "1970-01-01")

plot_data(h0)
```
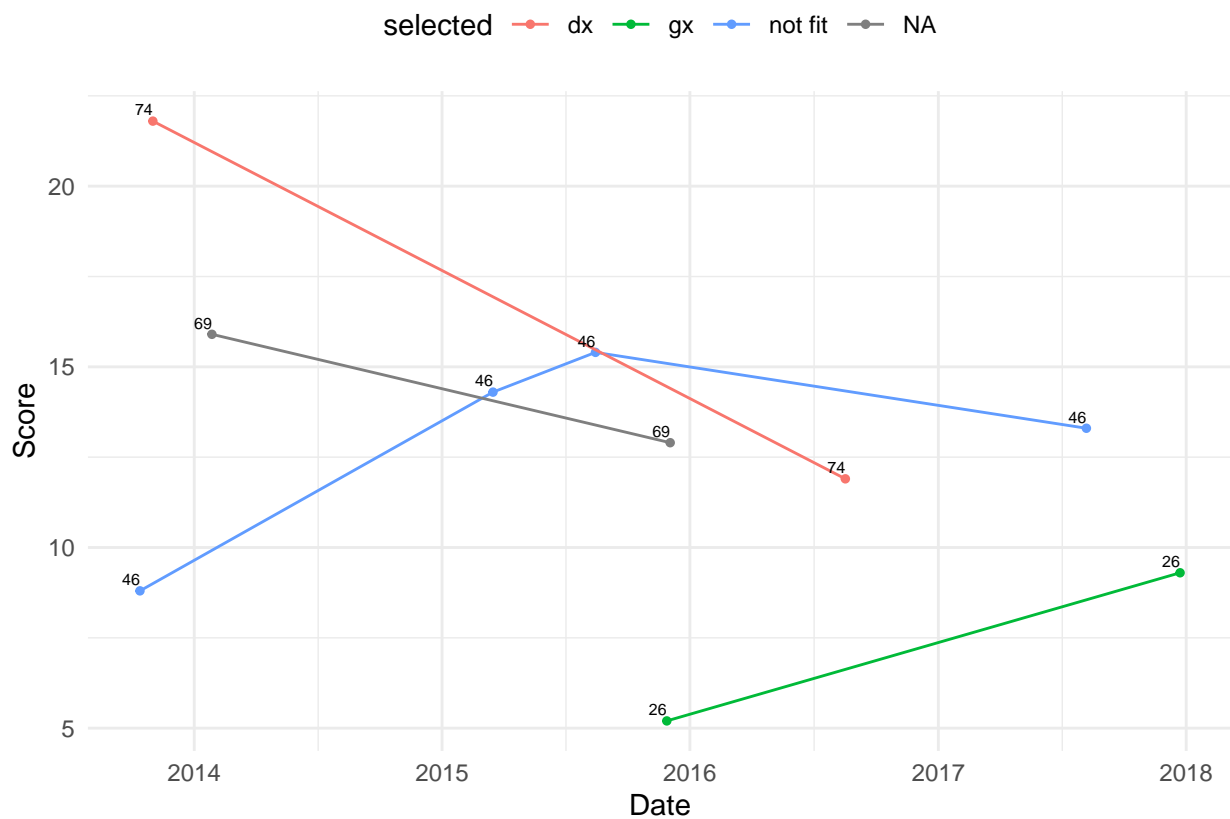
plot_data(h1)

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```r
# g-d-rate model for treatment RTX_V1V2

out_rtx_0 = gdrate(sub_dataframes$RTX_V1V2_0, 0.05, FALSE)
out_rtx_1 = gdrate(sub_dataframes$RTX_V1V2_1, 0.05, FALSE)

out_rtx_0$models
```

```
##       Group Analyzed               Type  N Percentage
## 1 excluded      no 2 evals not 20% diff  8         10
## 2 excluded     yes              not fit 22         28
## 3 included     yes                   dx 19         24
## 4 included     yes                   gd  9         12
## 5 included     yes                gdphi  1          1
## 6 included     yes                   gx 19         24
```

```r
out_rtx_1$models
```

```
##       Group Analyzed               Type N Percentage
## 1 excluded      no 2 evals not 20% diff 1         50
## 2 included     yes                   dx 1         50
```

```r
cols_to_select = c("type", "selected", "name")

gd1 = as.data.frame(out_rtx_0$allest[cols_to_select])
gd2 = as.data.frame(out_rtx_1$allest[cols_to_select])

# delete duplicated rows
gd1 = gd1[!duplicated(gd1), ]
gd2 = gd2[!duplicated(gd2), ]


h0 = merge(sub_dataframes$RTX_V1V2_0, gd1, by = "name", all = TRUE)
h1 = merge(sub_dataframes$RTX_V1V2_1, gd2, by = "name", all = TRUE)


h0$date = as.Date(h0$date, origin = "1970-01-01")
h1$date = as.Date(h1$date, origin = "1970-01-01")

plot_data(h0)
```
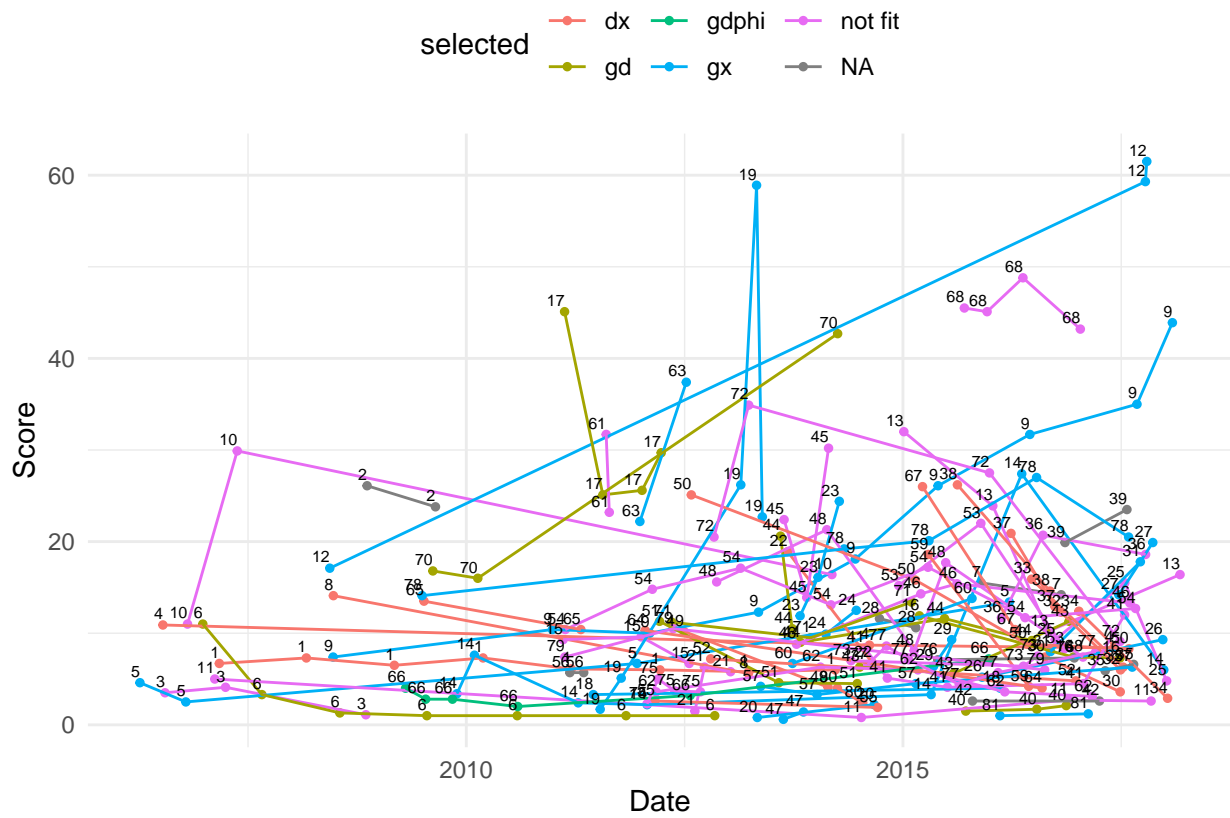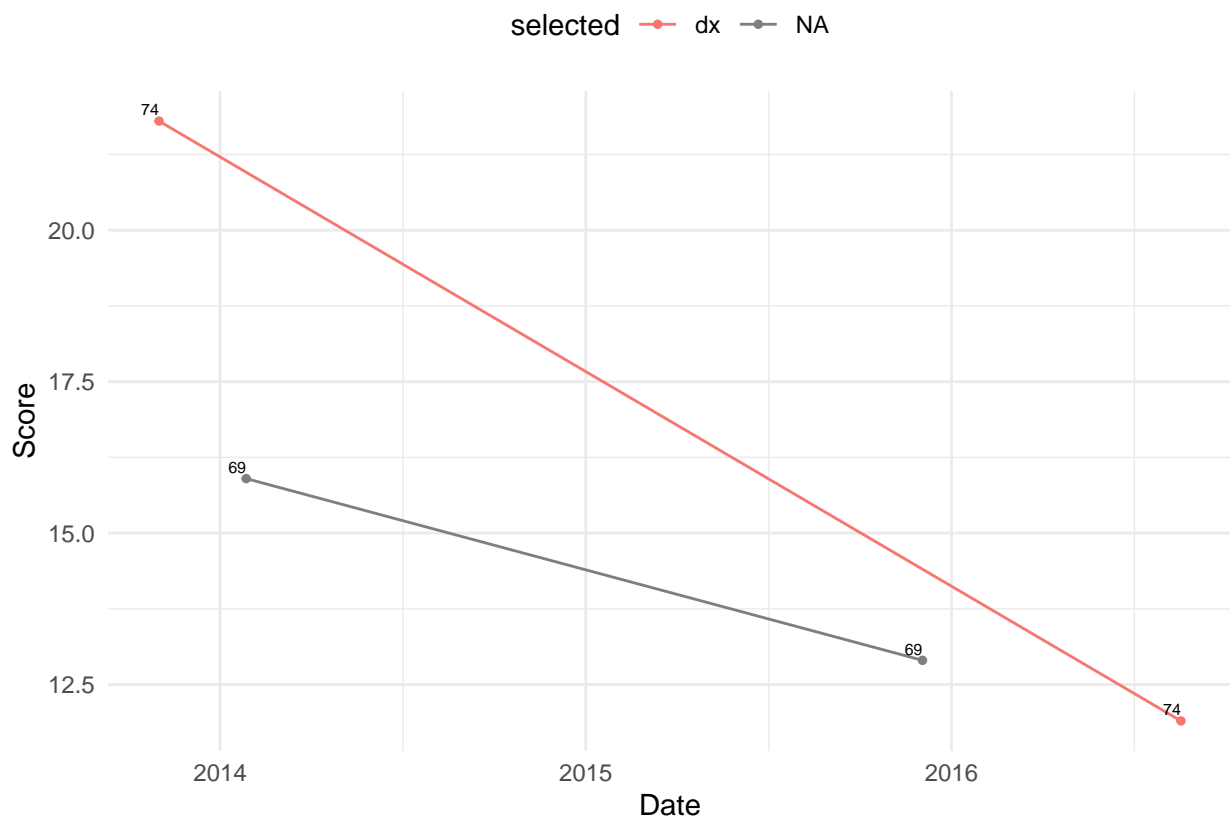
`plot_data(h1)`

```
# g-d-rate model for Immunosuppressant switch

swi_0 = gdrate(sub_dataframes$ISswitch_V1V2_0, 0.05, FALSE)
swi_1 = gdrate(sub_dataframes$ISswitch_V1V2_1, 0.05, FALSE)

swi_0$models
```

```
##       Group Analyzed                  Type  N Percentage
## 1 excluded       no 2 evals not 20% diff   7         11
## 2 excluded      yes              not fit  15         23
## 3 included      yes                   dx  17         27
## 4 included      yes                   gd   8         12
## 5 included      yes                gdphi   1          2
## 6 included      yes                   gx  16         25
```

```
swi_1$models
```

```
##       Group Analyzed                  Type N Percentage
## 1 excluded       no 2 evals not 20% diff  2         12
## 2 excluded      yes              not fit  7         44
## 3 included      yes                   dx  3         19
## 4 included      yes                   gd  1          6
## 5 included      yes                   gx  3         19
```

```
cols_to_select = c("type", "selected", "name")

gd1 = as.data.frame(swi_0$allest[cols_to_select])
gd2 = as.data.frame(swi_1$allest[cols_to_select])

# delete duplicated rows
gd1 = gd1[!duplicated(gd1), ]
gd2 = gd2[!duplicated(gd2), ]


h0 = merge(sub_dataframes$ISswitch_V1V2_0, gd1, by = "name", all = TRUE)
h1 = merge(sub_dataframes$ISswitch_V1V2_1, gd2, by = "name", all = TRUE)


h0$date = as.Date(h0$date, origin = "1970-01-01")
h1$date = as.Date(h1$date, origin = "1970-01-01")

plot_data(h0)
```
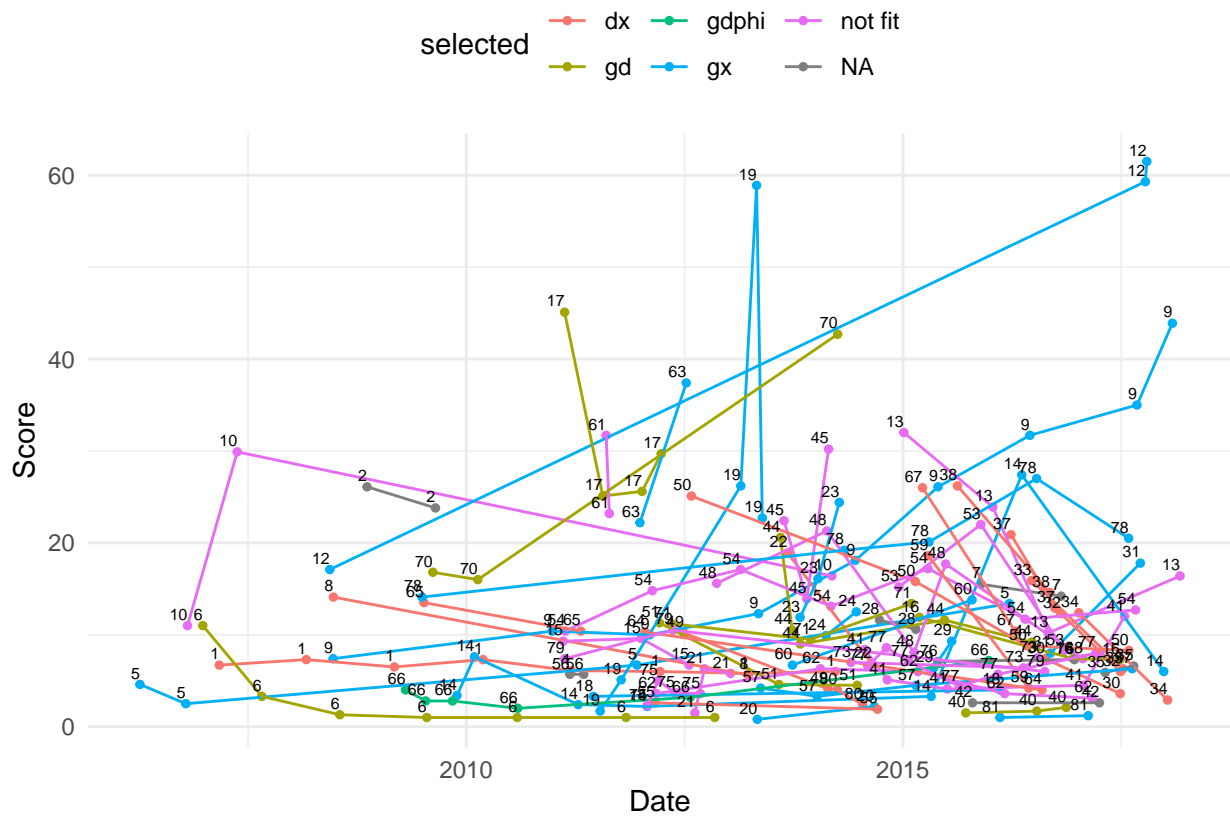
`plot_data(h1)`