

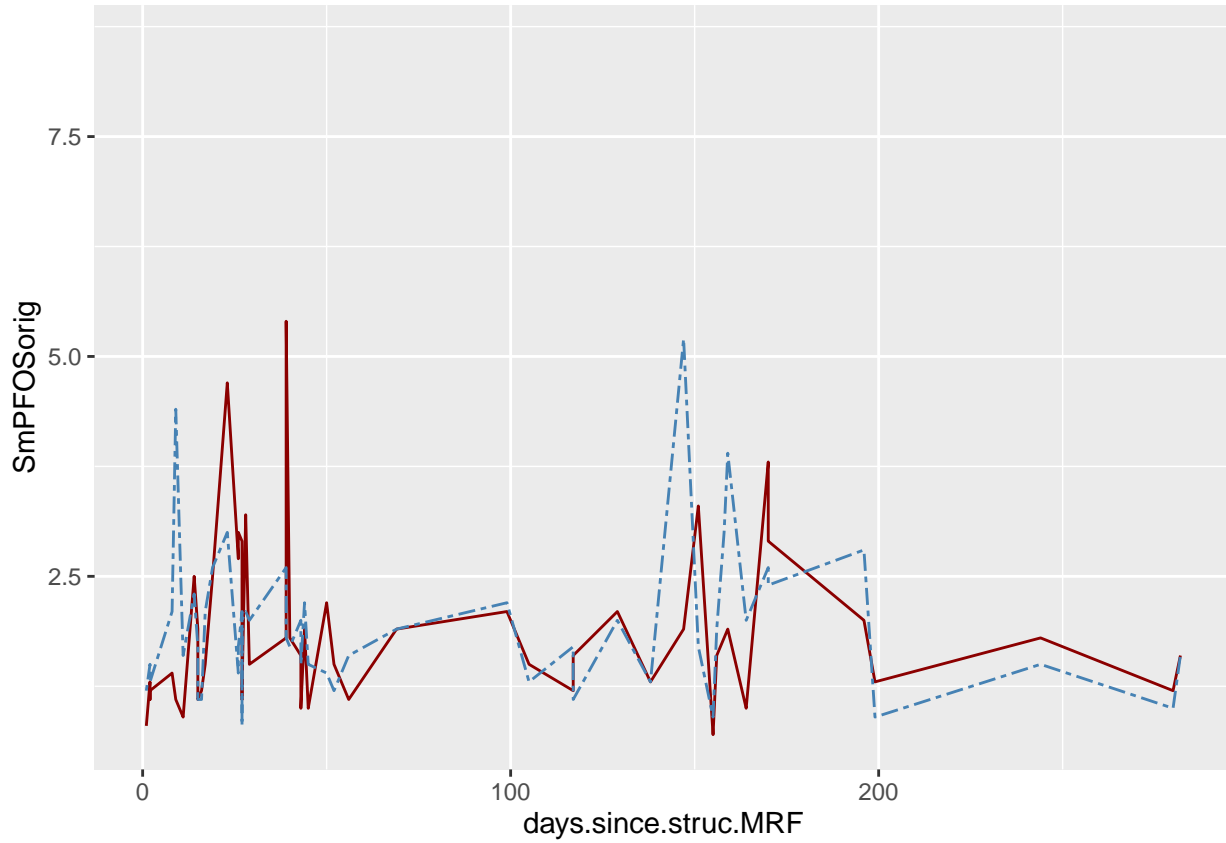
# TFD longitudinal analyses

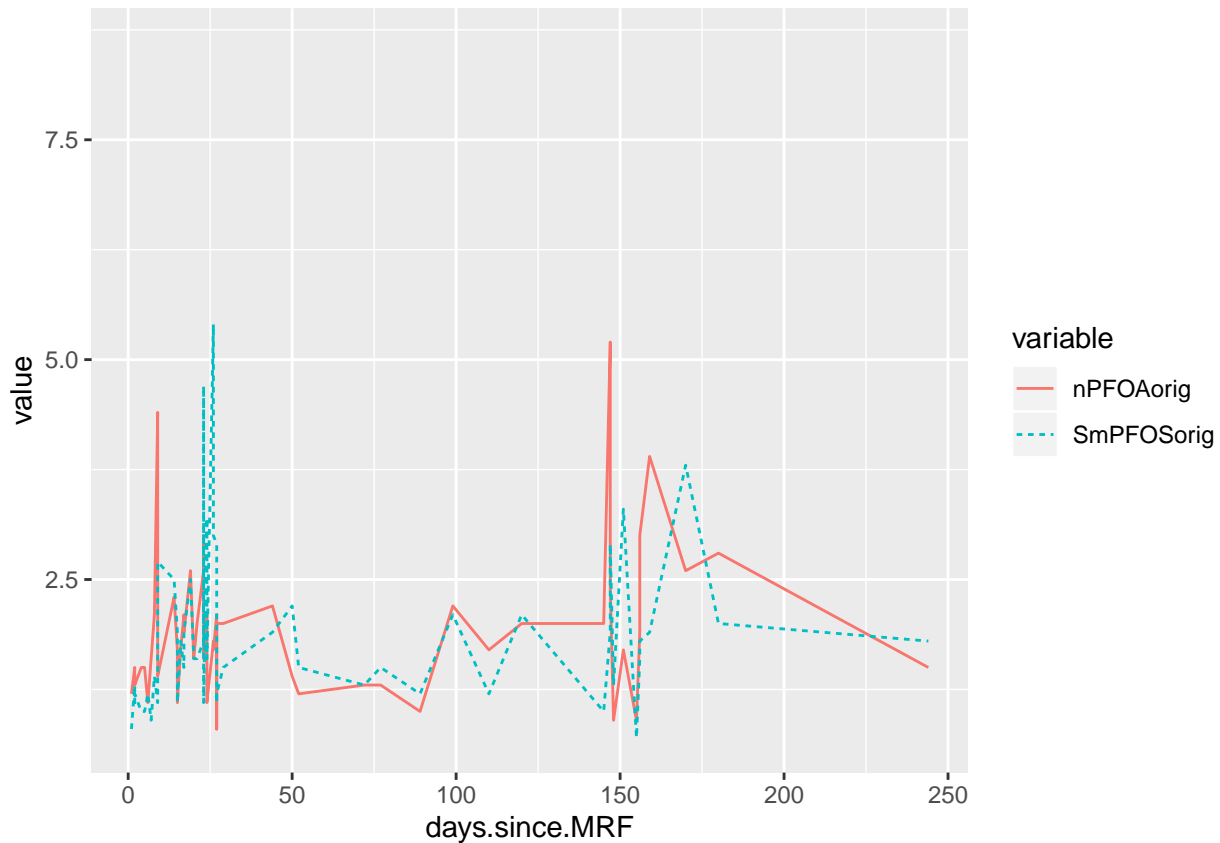
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*7/16/2020*

Should I remove subject 2009 (missing fire info) from FireTuk?

For the densities, include a color grouping for time (1 or 2). For the scatterplots, include lines between data points from the same person (to get a better understanding of slope). This corresponds to a grouping for each participant ID. We could include an additional grouping for ethnicity by gender if we want or a facet for ethnicity by gender.





```
# For each PFAS create separate models for:
# total structural number fire runs
# total duration
# structural fire duration
# time (in years since baseline)
# time since most recent fire run
# time since MR structural fire
# total number of fireruns

#write a function for different variables

# 6/30: removed women from FireChange, removed interaction term ethn.gen and replaced with Ethnicity
#Had to change the structure of the code in the model statements a bit due to the following error:
#Error in parse(text = trans_model_statement) :
# <text>:1:67: unexpected '='
#1: model_trans <- lm(PFOSAtrans ~ Ethnicity + total.num.firerunsdata =

exp_fxn <- function(dta, orig_outcome, trans_outcome, exp_outcome) {
  orig_model_statement <- paste0("model_orig <- lm(", orig_outcome,
                                " ~ ", exp_outcome, " + Ethnicity, data = dta)")
  eval(parse(text = orig_model_statement))
  trans_model_statement <- paste0("model_trans <- lm(", trans_outcome,
                                " ~ ", exp_outcome, " + Ethnicity, data = dta)")
  eval(parse(text = trans_model_statement))
  out <- list(model_orig = model_orig,
              model_trans = model_trans)
}
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analytes <- c("PFOSA", "nPFOA", "nPFOF", "PFDEA", "PFHXS", "PFNA", "PFUA", "SbPFOA", "SmPFOF")
exposures <- c("total.num.fireruns", "str.num.fireruns", "total.duration.hrs", "str.duration.hrs",
              "days.since.MRF", "days.since.struc.MRF", "time.since.baseline")
model_list <- list()
mean.change <- data.frame(Ethnicity = as.character(),
                          emmean = as.numeric(),
                          lower.CL = as.numeric(),
                          upper.CL = as.numeric(),
                          exposure = as.character(),
                          analyte = as.character(),
                          stringsAsFactors = FALSE)

for (analyte in analytes) {
  for (exposure in exposures) {
    orig_var <- paste0(analyte, "orig")
    trans_var <- paste0(analyte, "trans")
    out_info <- exp_fxn(FireChange, orig_var, trans_var, exposure)
    ggarrange(plot(resid(out_info$model_orig) ~ fitted(out_info$model_orig)) + abline(h = 0),
              plot(resid(out_info$model_trans) ~ fitted(out_info$model_trans)) + abline(h = 0),
              qqnorm(resid(out_info$model_orig)),
              qqnorm(resid(out_info$model_trans)),
              nrow = 2, ncol = 2)
    stargazer(out_info$model_trans)
  }
}

for (analyte in analytes) {
  model_list[[analyte]] <- list()
  for (exposure in exposures) {
    orig_var <- paste0(analyte, "orig")
    trans_var <- paste0(analyte, "trans")
    out_info <- exp_fxn(FireChange2, orig_var, trans_var, exposure)
    model_list[[analyte]][[exposure]] <- out_info
    meanNH <- mean(FireChange2 %>% filter(Ethnicity== 'Non-hispanic') %>% .[, exposure], na.rm = TRUE)
    meanH <- mean(FireChange2 %>% filter(Ethnicity== 'Hispanic') %>% .[, exposure], na.rm = TRUE)
    NH.mean.change <- eval(parse(text = paste0("emmeans(model_list[[analyte]][[exposure]]$model_orig, 'E
      summary() %>%
      filter(Ethnicity == "Non-hispanic")
    H.mean.change <- eval(parse(text = paste0("emmeans(model_list[[analyte]][[exposure]]$model_orig, 'E
      summary() %>%
      filter(Ethnicity == "Hispanic")
    mean.change <- rbind(mean.change,
                        rbind(H.mean.change, NH.mean.change) %>%
                        mutate(exposure = exposure,
                               analyte = analyte) %>%
                        dplyr::select(-SE, -df))
  }

# print(ggarrange(plot(resid(out_info$model_orig) ~ fitted(out_info$model_orig)) + abline(h = 0),
#                  plot(resid(out_info$model_trans) ~ fitted(out_info$model_trans)) + abline(h = 0),
#                  qqnorm(resid(out_info$model_orig)),
#                  qqnorm(resid(out_info$model_trans)),

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#           nrow = 2, ncol = 2))
stargazer(model_list[[analyte]][[exposures[1]]]$model_orig,
           model_list[[analyte]][[exposures[2]]]$model_orig,
           model_list[[analyte]][[exposures[3]]]$model_orig,
           model_list[[analyte]][[exposures[4]]]$model_orig,
           title = "PFAS Change Score Model Results (No Transformation)",
           single.row = FALSE, header = FALSE,
           omit.stat = c("f", "ser"), report = "vctp*",
           intercept.bottom = FALSE, intercept.top = TRUE,
           digits = 3, font.size = "scriptsize")
stargazer(model_list[[analyte]][[exposures[5]]]$model_orig,
           model_list[[analyte]][[exposures[6]]]$model_orig,
           model_list[[analyte]][[exposures[7]]]$model_orig,
           title = "PFAS Change Score Model Results (No Transformation)",
           single.row = FALSE, header = FALSE,
           omit.stat = c("f", "ser"), report = "vctp*",
           intercept.bottom = FALSE, intercept.top = TRUE,
           digits = 3, font.size = "scriptsize")
}

true.mean <- mean.change %>%
  filter(exposure == 'str.num.fireruns') %>%
  left_join(mean.frame, by = c("Ethnicity", "analyte")) # You should compare these to the scatterplots

knitr::opts_template$set("kill_prefix"=list(comment=NA, null_prefix=TRUE))

pfas.list <- c("PFOSAorig", "nPFOAorig", "nPFOSorig", "PFDEAorig", "PFHXSorig", "PFNAorig", "PFUAorig",
              "SbPFOAorig", "SmPFOSorig")
pfastrans.list <- c("PFOSAttrans", "nPFOAttrans", "nPFOSAttrans", "PFDEAttrans", "PFHXSttrans",
                   "PFNAAttrans", "PFUAAttrans", "SbPFOAttrans", "SmPFOSAttrans")
fire.list <- c("total.num.fireruns", "str.num.fireruns", "total.duration.hrs", "str.duration.hrs",
              "days.since.MRF", "days.since.struc.MRF", "time.since.baseline")

change_plot_fxn <- function(df, pfas, pfas.trans, fire.var) {
  pfas_orig <- paste0("pfasmdl <- lm(", pfas, " ~ ", fire.var, " + Ethnicity, data = df)")
  eval(parse(text = pfas_orig))
  pfas_trans <- paste0("transmdl <- lm(", pfas.trans, " ~ ", fire.var, " + Ethnicity, data = df)")
  eval(parse(text = pfas_trans))
  out <- list(pfasmdl = pfasmdl,
             transmdl = transmdl)
}

for (i in 1:length(pfas.list)) {
  pfas.name <- pfas.list[i]
  Tpfas.name <- pfastrans.list[i]
  for (fire.var in fire.list) {
    out_info <- change_plot_fxn(FireChange2, pfas.name, Tpfas.name, fire.var)

    #Fitted vs. residuals
    orig.resid<- ggplot(data.frame(resid = resid(out_info$pfasmdl),
                                   fitted = fitted(out_info$pfasmdl)),
                      aes(x = fitted, y = resid)) +
      geom_point(size = 2) +

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    geom_hline(yintercept = 0) +
    theme(axis.text = element_text(size = 10),
          plot.title = element_text(hjust = 0.5)) +
    labs(title = paste0(out_info$pfasmdl$terms[[2]], ": ",
                        out_info$pfasmdl$terms[[3]][2]))
trans.resid <- ggplot(data.frame(resid = resid(out_info$transmdl),
                                fitted = fitted(out_info$transmdl)),
                     aes(x = fitted, y = resid)) +
    geom_point(size = 2) +
    geom_hline(yintercept = 0) +
    theme(axis.text = element_text(size = 10),
          plot.title = element_text(hjust = 0.5)) +
    labs(title = paste0(out_info$transmdl$terms[[2]], ": ",
                        out_info$pfasmdl$terms[[3]][2]))

ys.orig <- quantile(qqnorm(resid(out_info$pfasmdl), plot.it = F)$y, probs = c(0.25, 0.75),
                   qtype = 7)
xs.orig <- quantile(qqnorm(resid(out_info$pfasmdl), plot.it = F)$x, probs = c(0.25, 0.75),
                   qtype = 7)
m.orig <- (ys.orig[2] - ys.orig[1]) / (xs.orig[2] - xs.orig[1])
b.orig <- ys.orig[2] - m.orig * xs.orig[2]

ys.trans <- quantile(qqnorm(resid(out_info$transmdl), plot.it = F)$y,
                    probs = c(0.25, 0.75), qtype = 7)
xs.trans <- quantile(qqnorm(resid(out_info$transmdl), plot.it = F)$x, probs = c(0.25, 0.75),
                    qtype = 7)
m.trans <- (ys.trans[2] - ys.trans[1]) / (xs.trans[2] - xs.trans[1])
b.trans <- ys.trans[2] - m.trans * xs.trans[2]

assumptions.df <- data.frame(orig_qq_theor = qqnorm(resid(out_info$pfasmdl), plot.it = F)$x,
                             orig_qq_samp = qqnorm(resid(out_info$pfasmdl), plot.it = F)$y,
                             stringsAsFactors = F)

assumptions.df.t <- data.frame(trans_qq_theor = qqnorm(resid(out_info$transmdl),
                                                         plot.it = F)$x,
                               trans_qq_samp = qqnorm(resid(out_info$transmdl), plot.it = F)$y,
                               stringsAsFactors = F)

qq.plot.orig <- ggplot(assumptions.df, aes(x = orig_qq_theor, y = orig_qq_samp)) +
  geom_point() +
  geom_abline(intercept = b.orig, slope = m.orig) +
  labs(x = "Theoretical Quantiles",
       y = "Sample Quantiles",
       title = paste0(out_info$pfasmdl$terms[[2]], ": ",
                       out_info$pfasmdl$terms[[3]][2])) +
  theme(plot.title = element_text(hjust = 0.5, size = 10),
        axis.title = element_text(size = 10))

qq.plot.trans <- ggplot(assumptions.df.t, aes(x = trans_qq_theor, y = trans_qq_samp)) +
  geom_point() +
  geom_abline(intercept = b.trans, slope = m.trans) +
  labs(x = "Theoretical Quantiles",
       y = "Sample Quantiles",

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        title = paste0(out_info$transmdl$terms[[2]], ":", " ",
                        out_info$transmdl$terms[[3]][2])) +
    theme(plot.title = element_text(hjust = 0.5, size = 10),
          axis.title = element_text(size = 10))

#Cooks distance plots
cd.plot.orig <- cooks_distance_plot(out_info$pfasmdl,
                                    paste0(out_info$pfasmdl$terms[[2]], ":", " ",
                                             out_info$pfasmdl$terms[[3]][2]))

cd.plot.trans <- cooks_distance_plot(out_info$transmdl, paste0(out_info$transmdl$terms[[2]], ":", " ",
                                                                out_info$transmdl$terms[[3]][2]))

#DFBETA plots
fbeta1 <- fbetas_plot(out_info$pfasmdl, paste0(out_info$pfasmdl$terms[[2]], ":", " ",
                                                out_info$pfasmdl$terms[[3]][2]))
fbeta2 <- fbetas_plot(out_info$transmdl, paste0(out_info$transmdl$terms[[2]], ":", " ",
                                                out_info$transmdl$terms[[3]][2]))

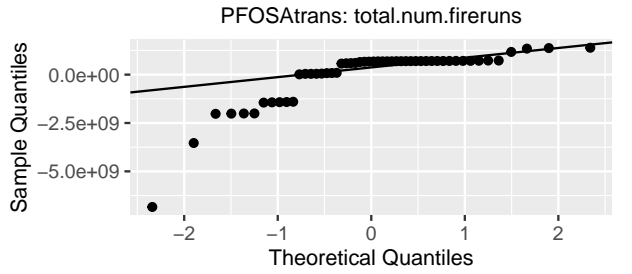
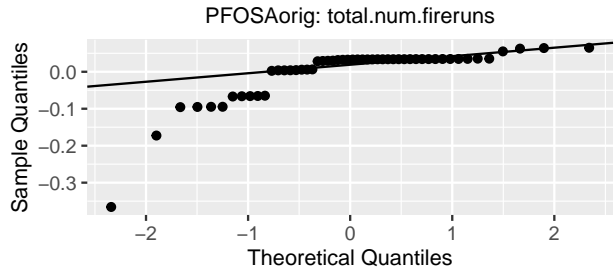
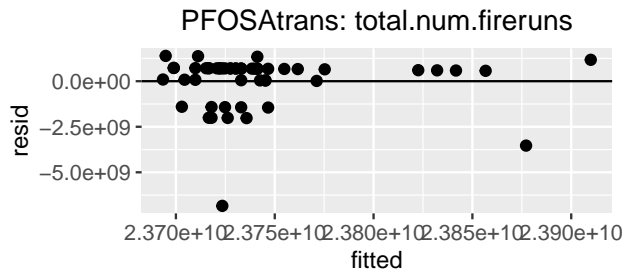
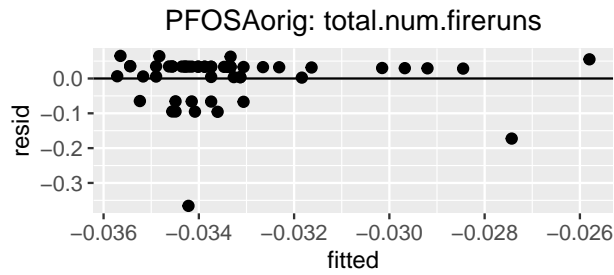
beta.fire <- list(fbeta1[[2]][1]$plot, fbeta2[[2]][1]$plot)

plotlist.a <- list(orig.resid, trans.resid, qq.plot.orig, qq.plot.trans,
                  cd.plot.orig$plot, cd.plot.trans$plot,
                  fbeta1$`(Intercept)`$plot, fbeta2$`(Intercept)`$plot,
                  fbeta1$EthnicityHispanic$plot, fbeta2$EthnicityHispanic$plot,
                  fbeta1[[2]][1]$plot, fbeta2[[2]][1]$plot)

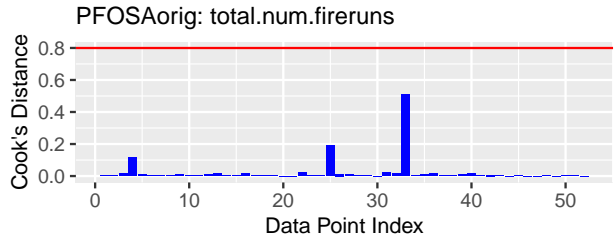
print(ggarrange(plotlist = plotlist.a, nrow = 6, ncol = 2))

}
}

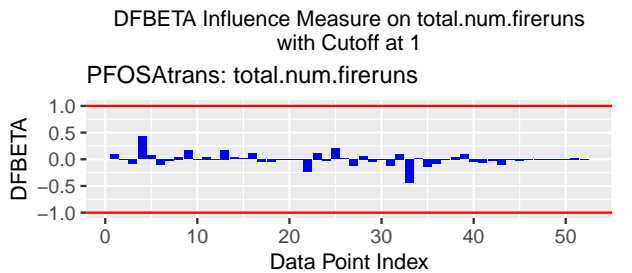
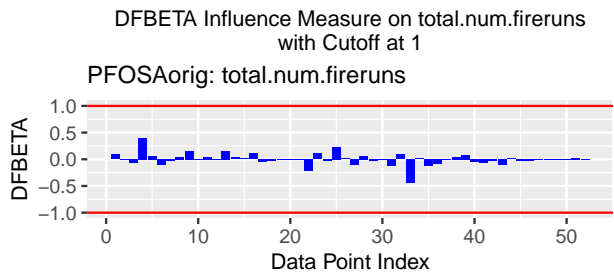
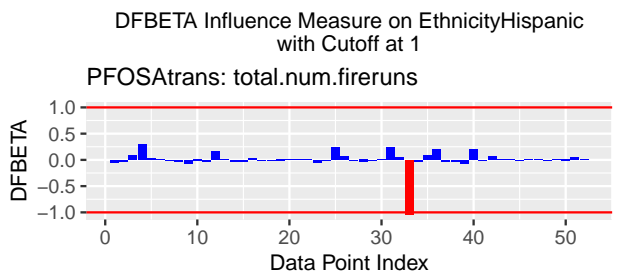
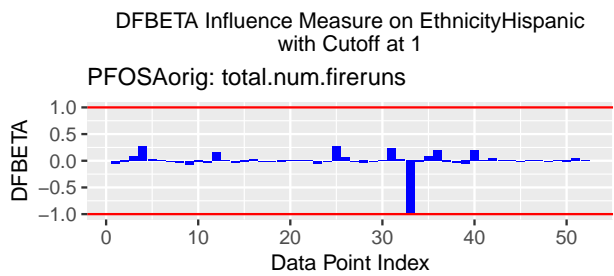
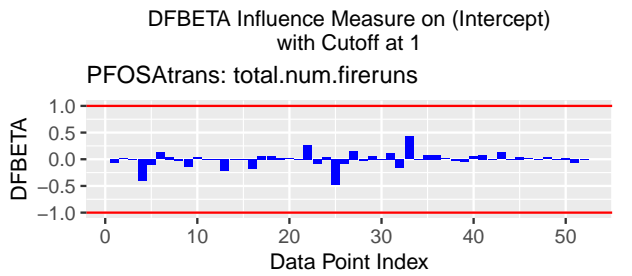
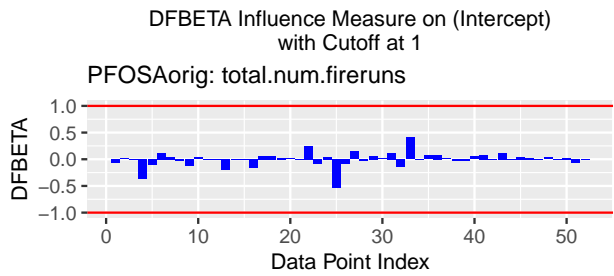
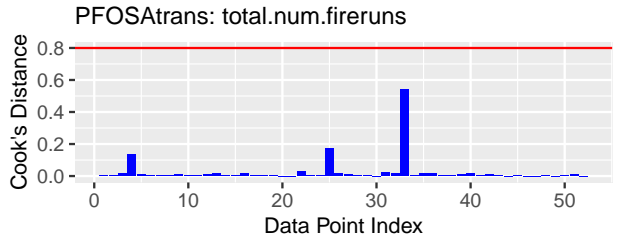
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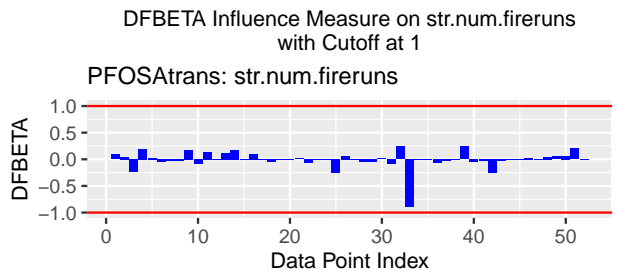
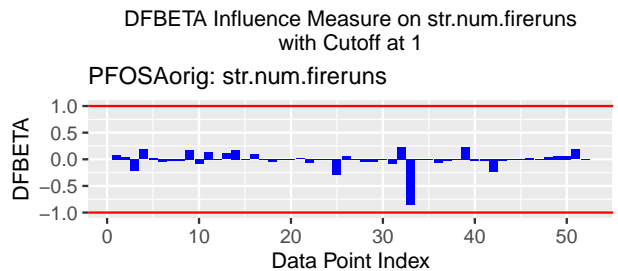
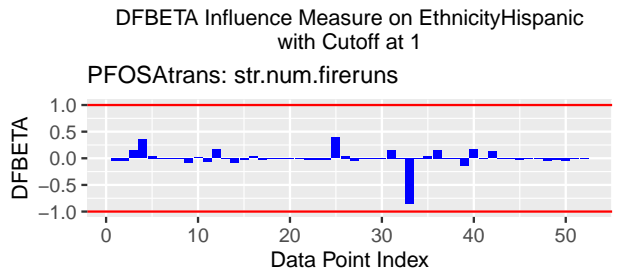
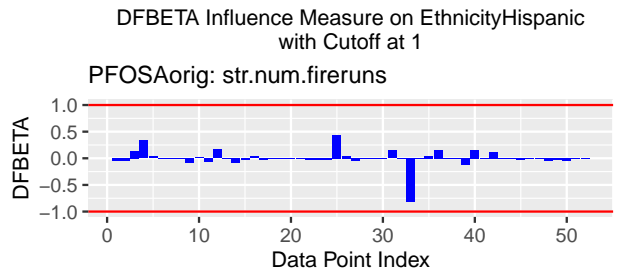
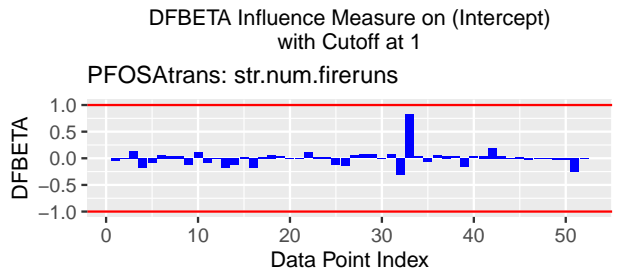
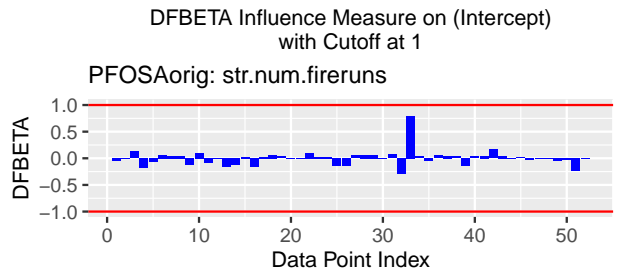
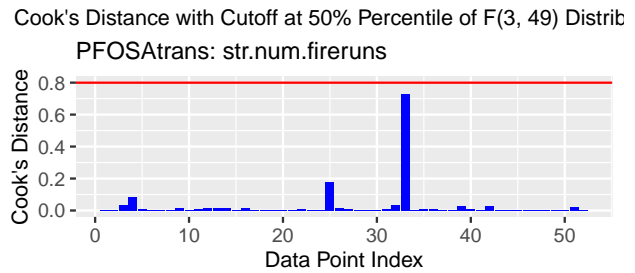
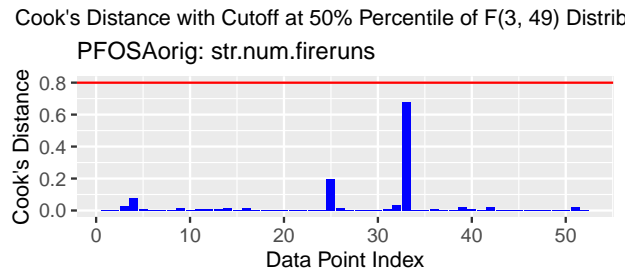
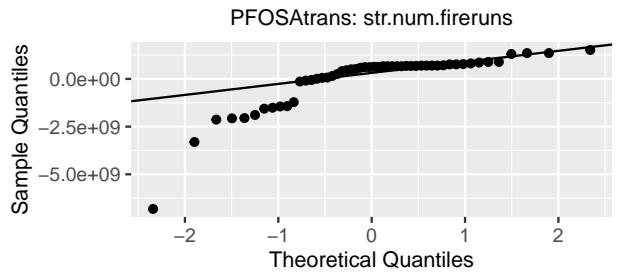
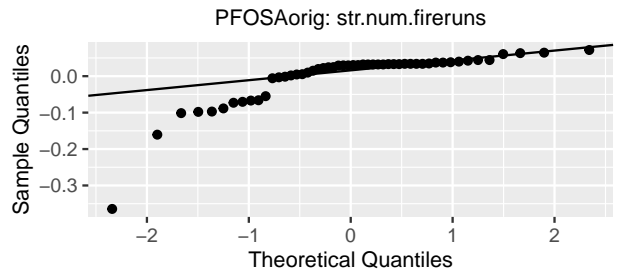
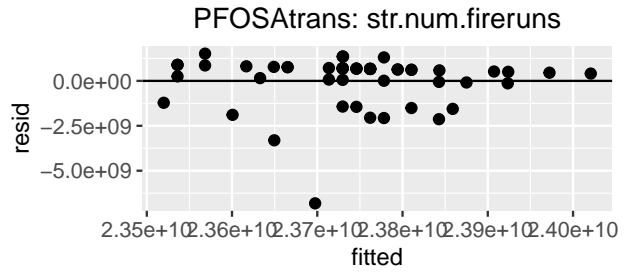
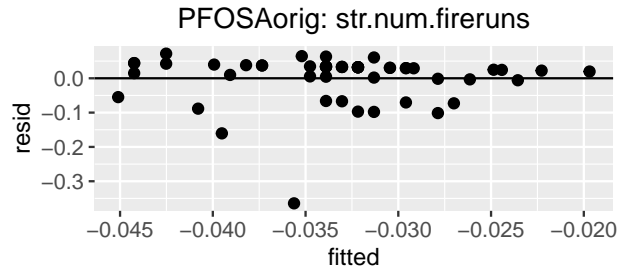
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

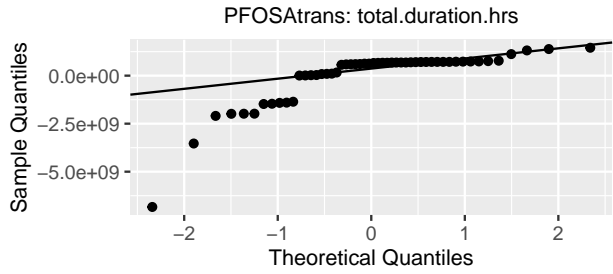
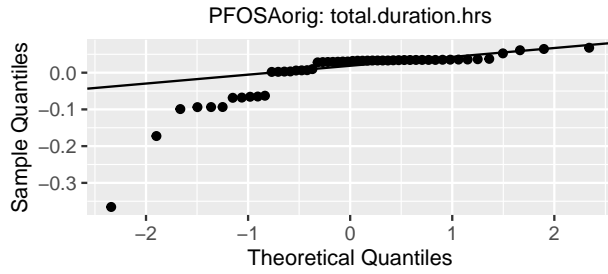
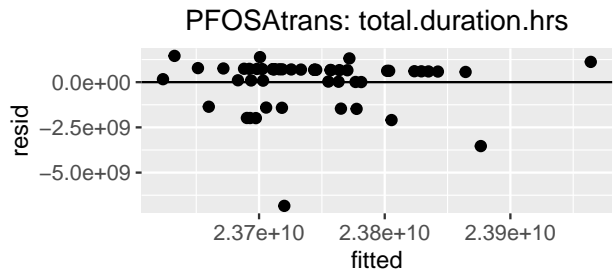
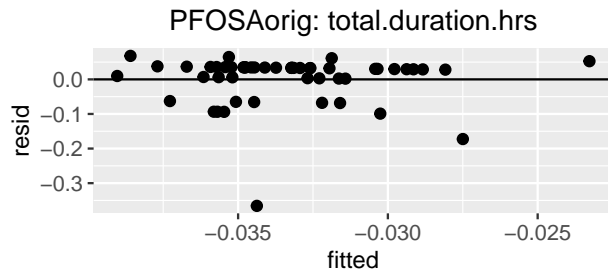


Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

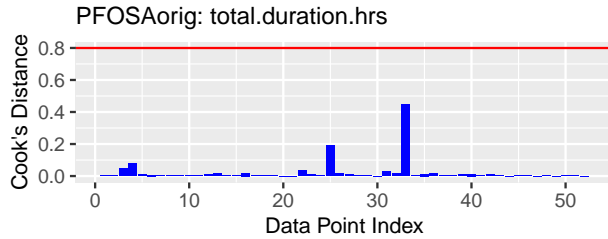




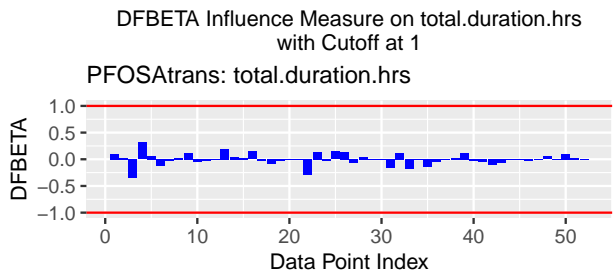
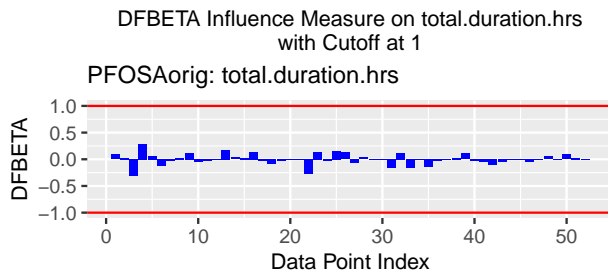
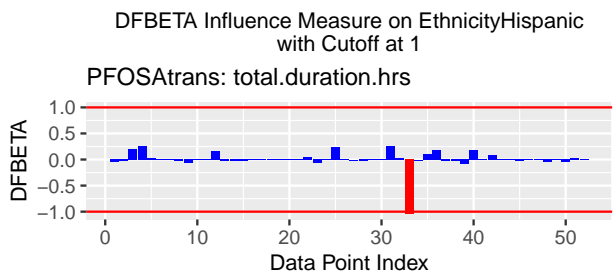
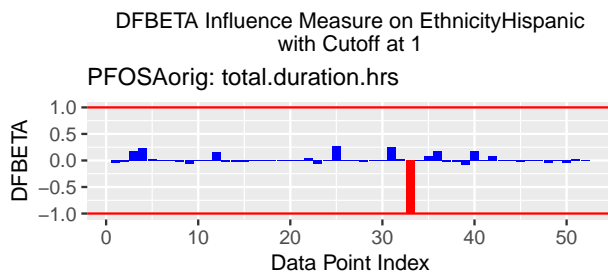
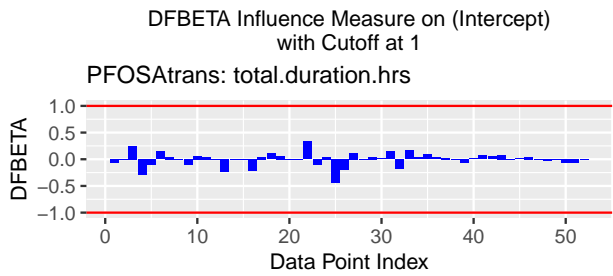
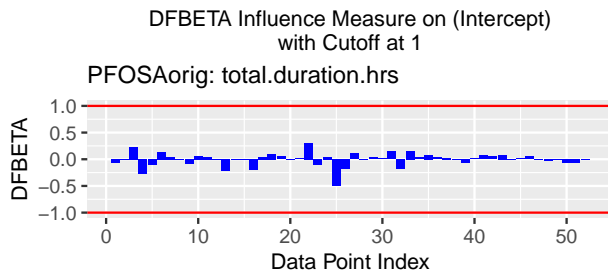
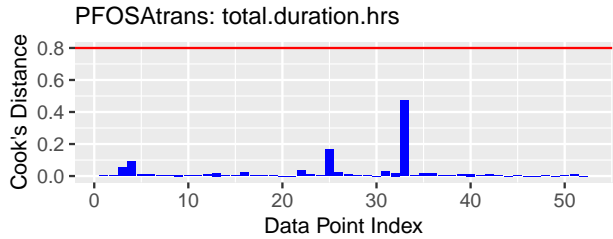


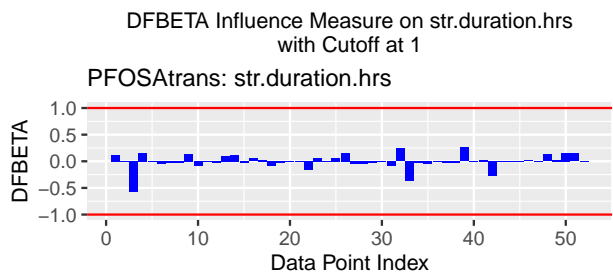
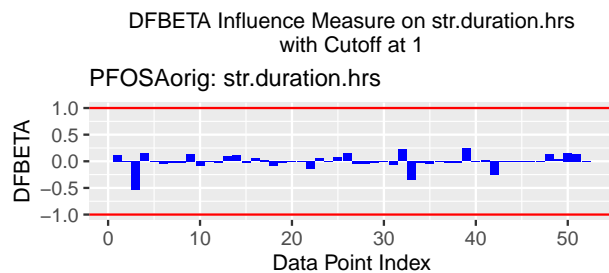
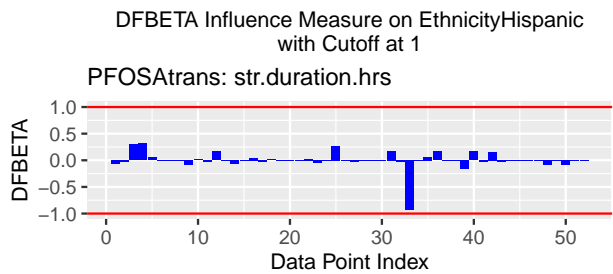
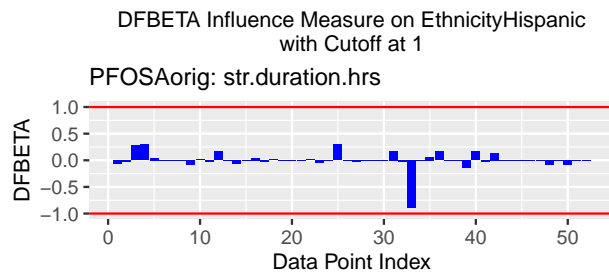
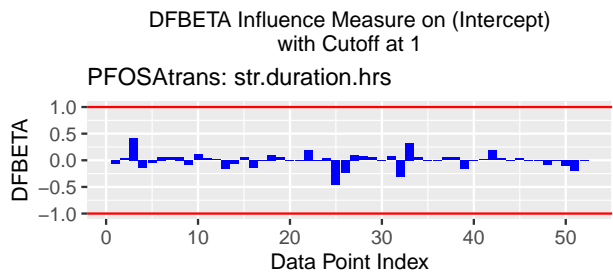
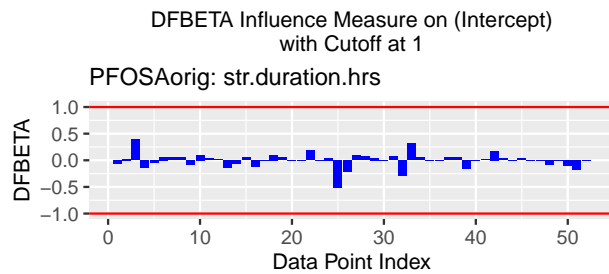
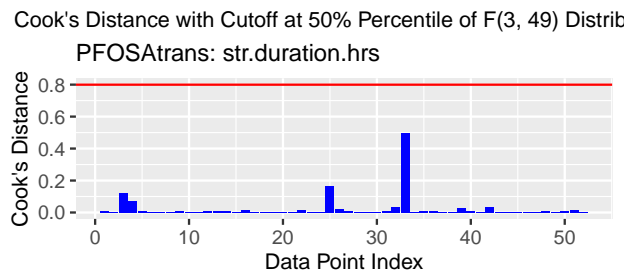
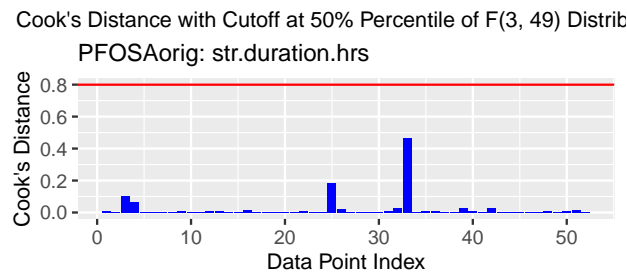
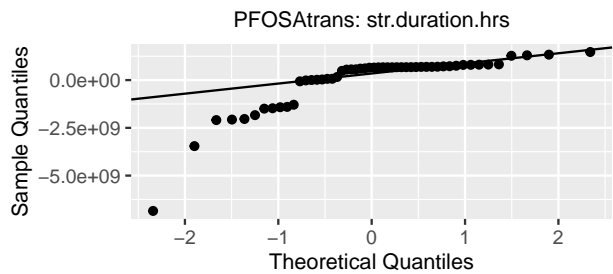
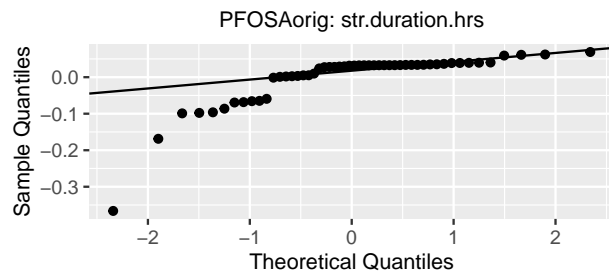
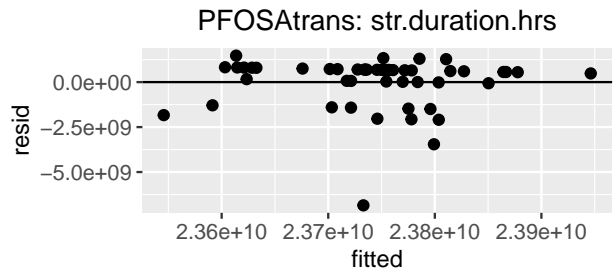
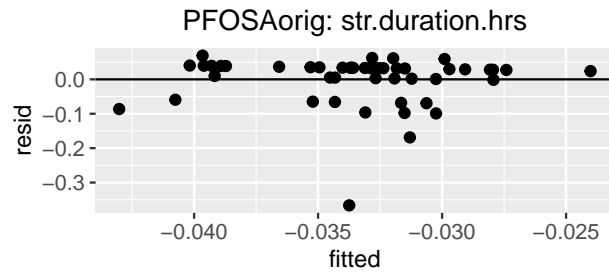


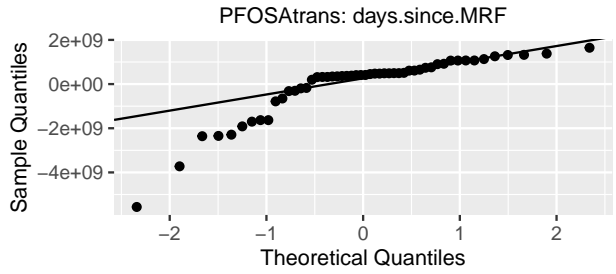
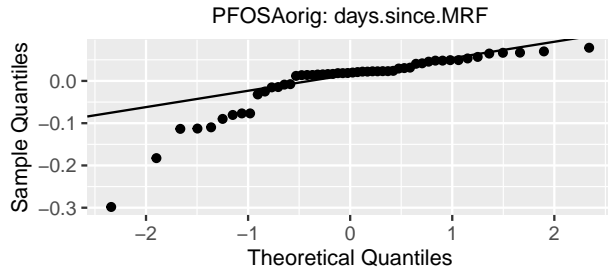
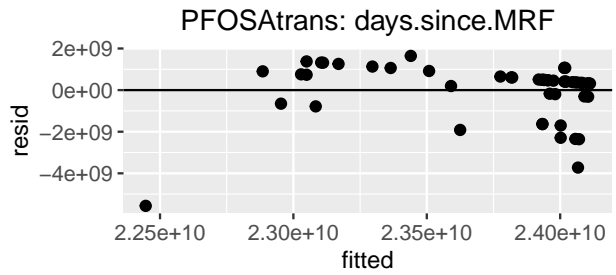
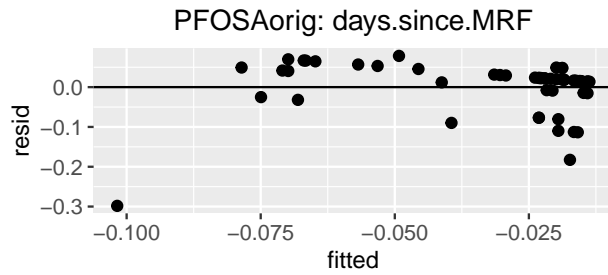
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib



Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

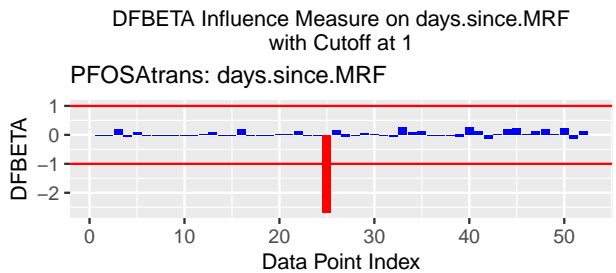
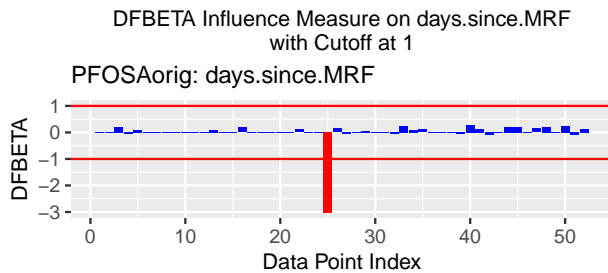
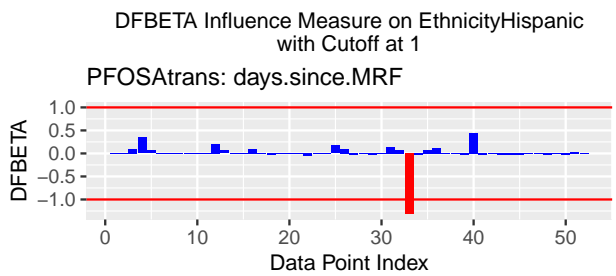
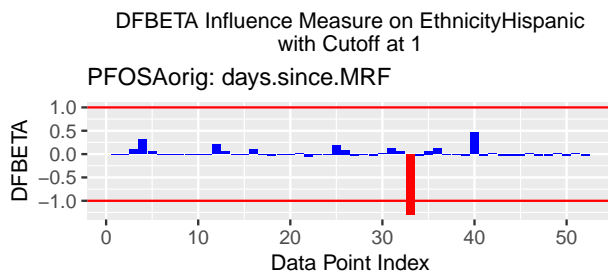
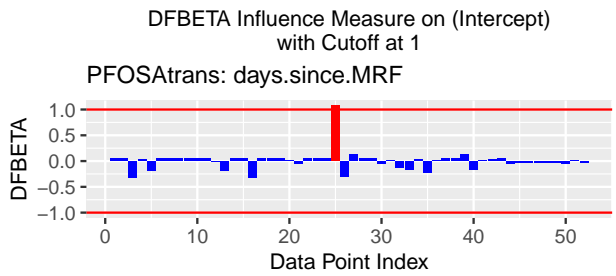
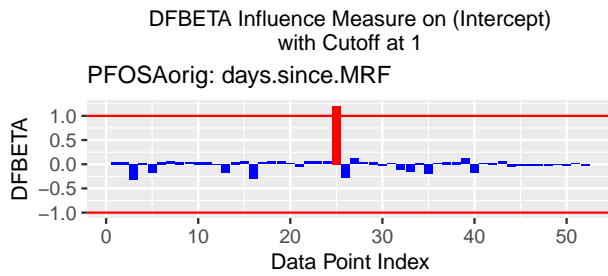
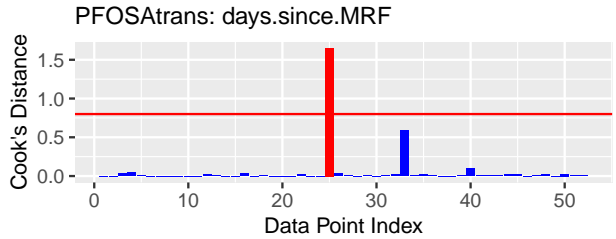
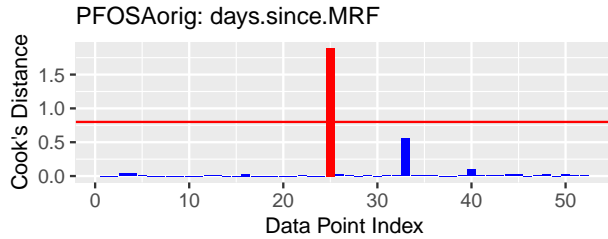


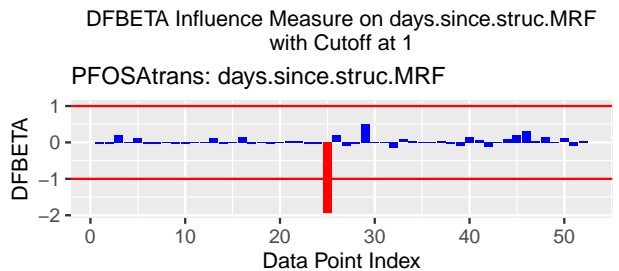
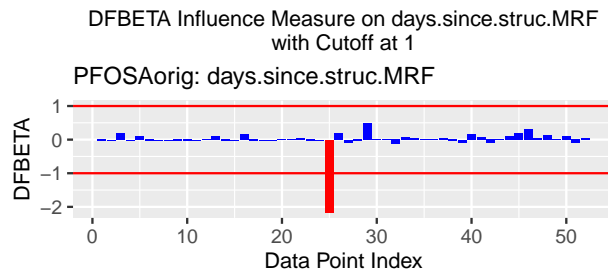
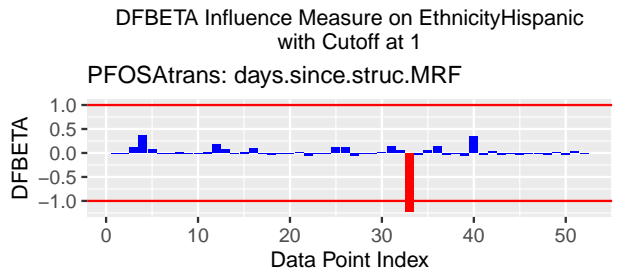
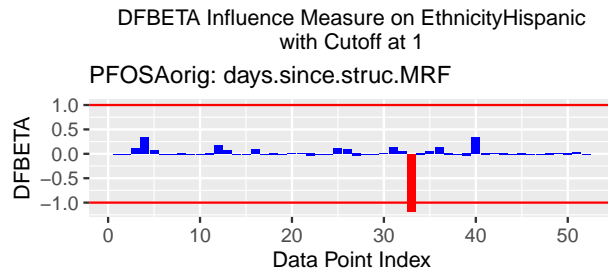
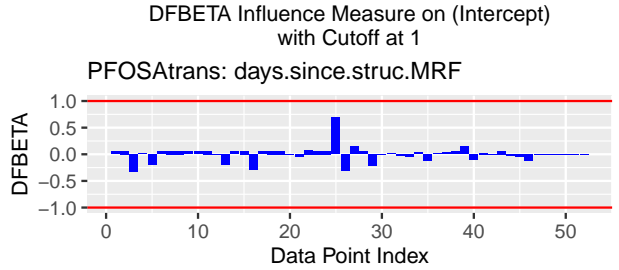
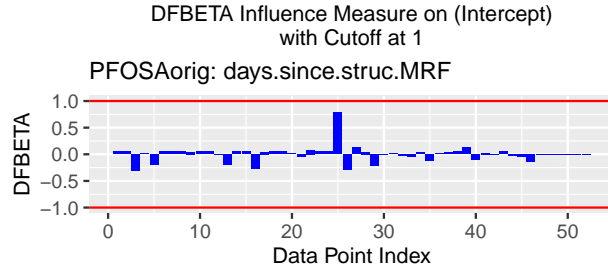
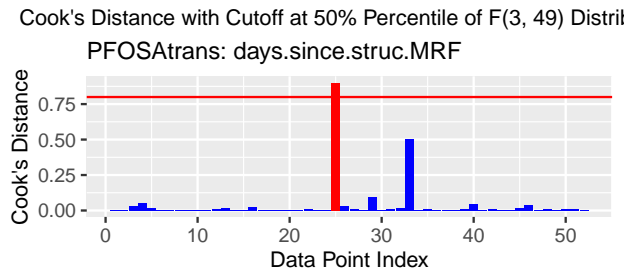
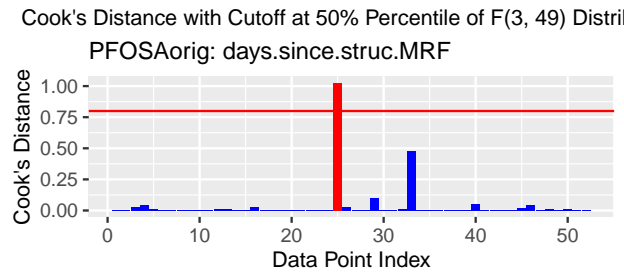
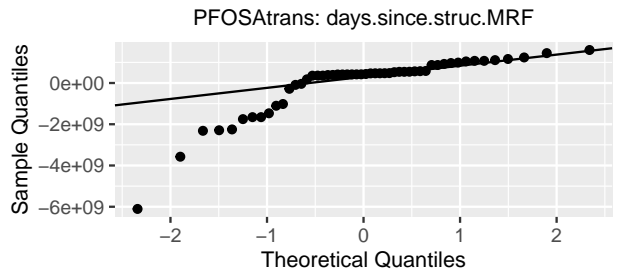
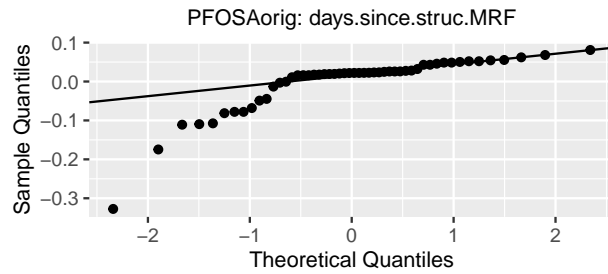
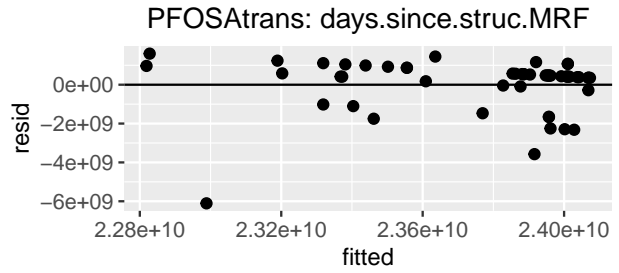
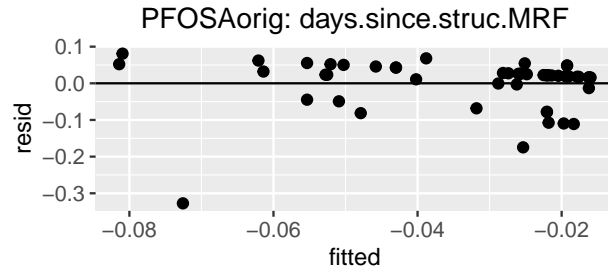


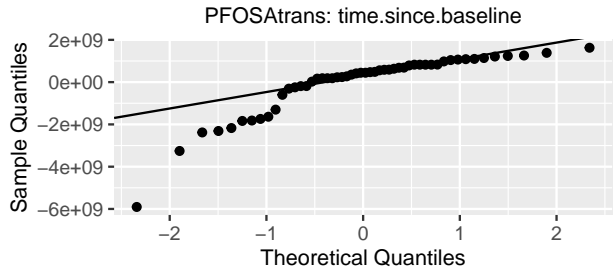
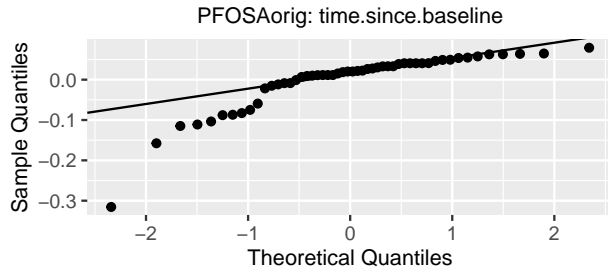
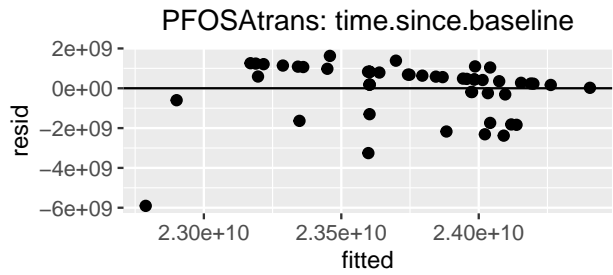
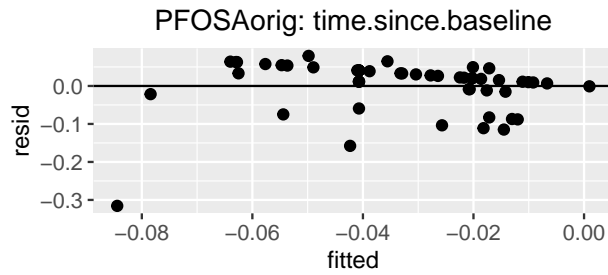


Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

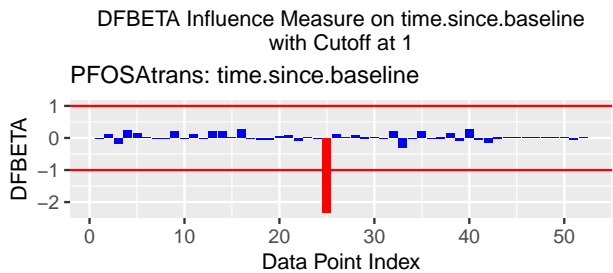
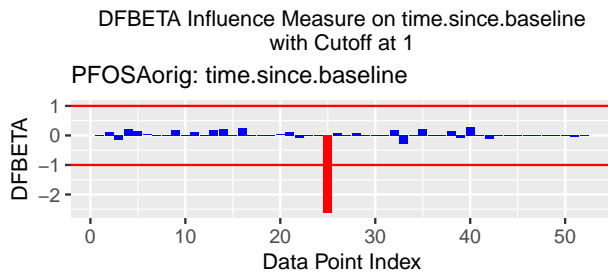
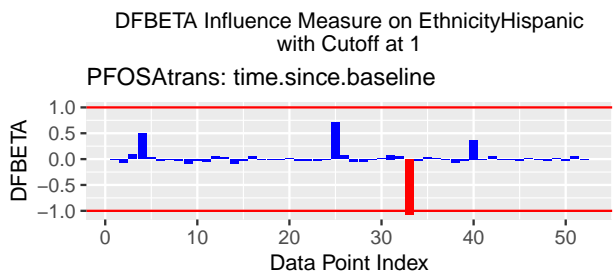
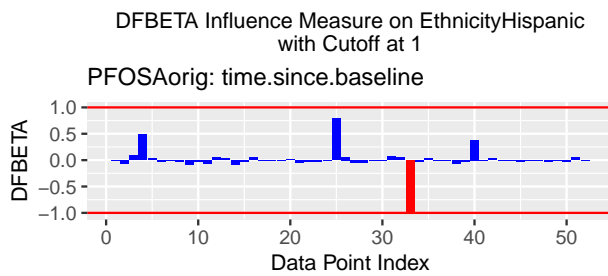
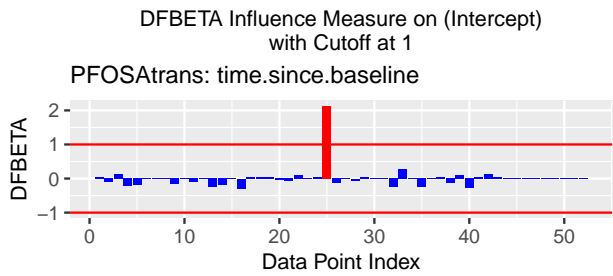
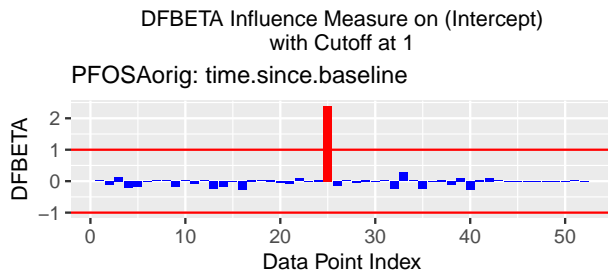
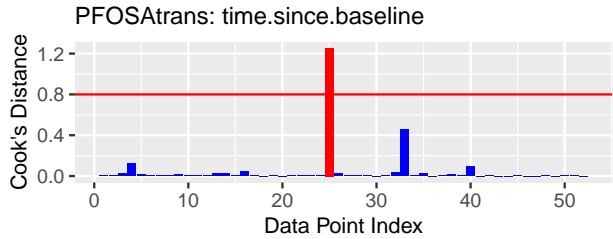
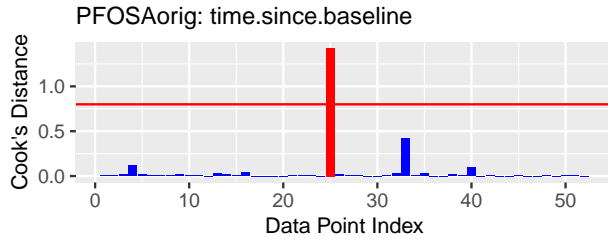


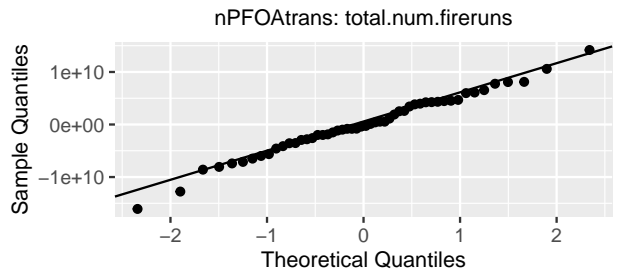
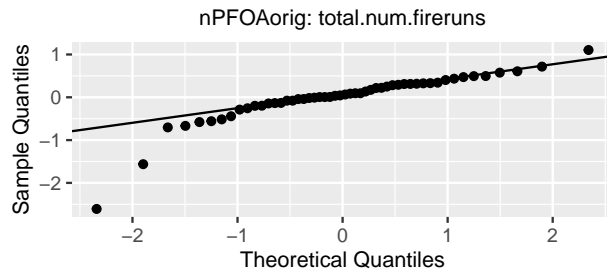
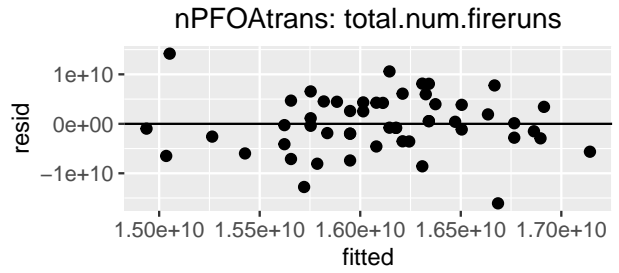
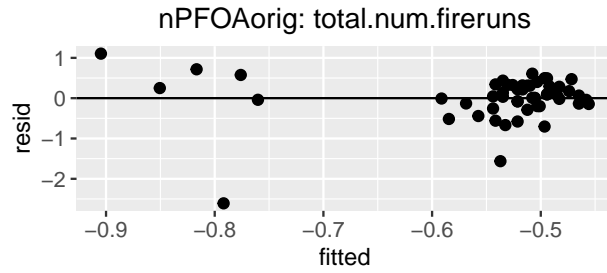




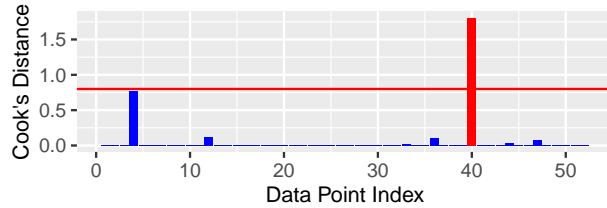
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

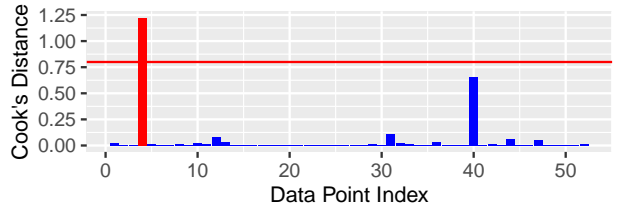




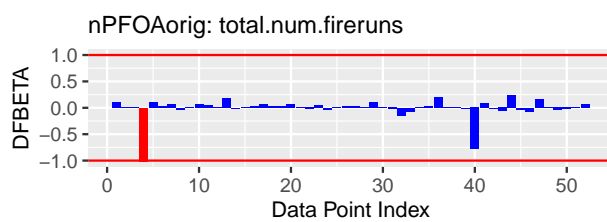
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib  
nPFOAorig: total.num.fireruns



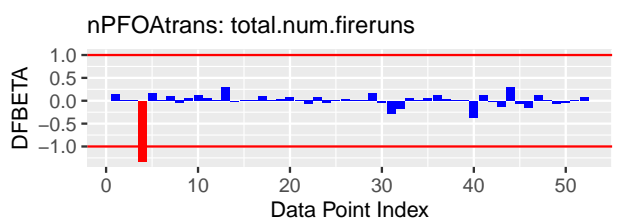
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib  
nPFOAtrans: total.num.fireruns



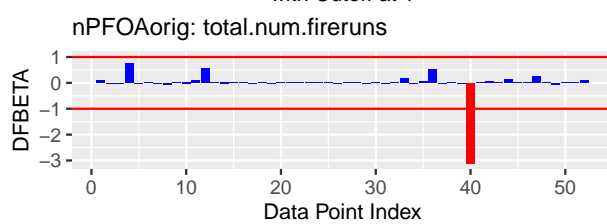
DFBETA Influence Measure on (Intercept)  
with Cutoff at 1  
nPFOAorig: total.num.fireruns



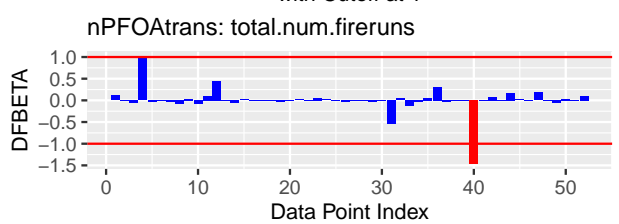
DFBETA Influence Measure on (Intercept)  
with Cutoff at 1  
nPFOAtrans: total.num.fireruns



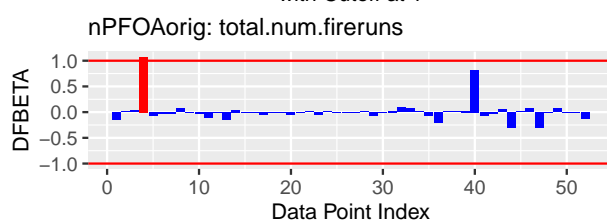
DFBETA Influence Measure on EthnicityHispanic  
with Cutoff at 1  
nPFOAorig: total.num.fireruns



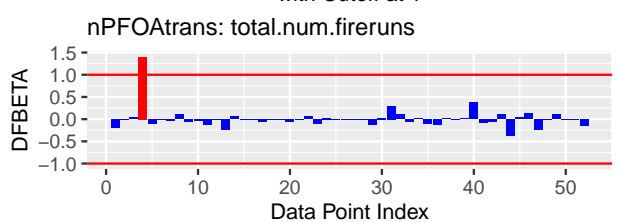
DFBETA Influence Measure on EthnicityHispanic  
with Cutoff at 1  
nPFOAtrans: total.num.fireruns

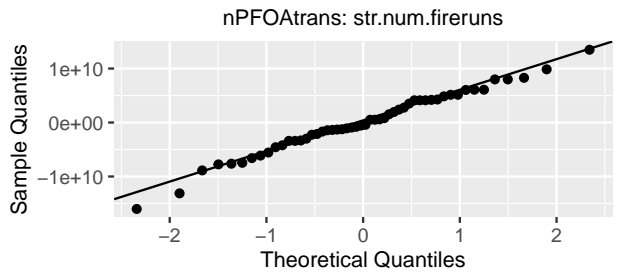
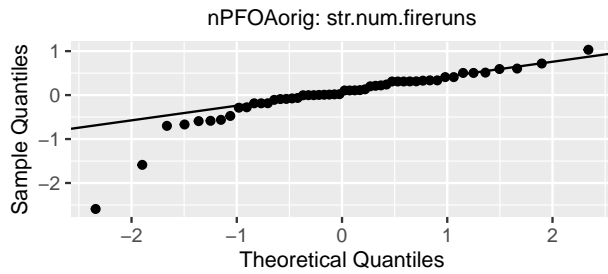
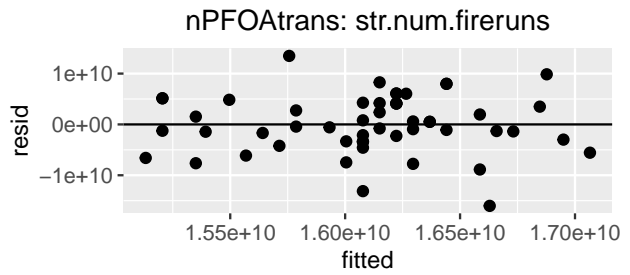
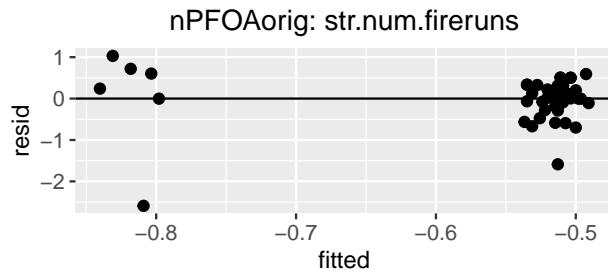


DFBETA Influence Measure on total.num.fireruns  
with Cutoff at 1  
nPFOAorig: total.num.fireruns

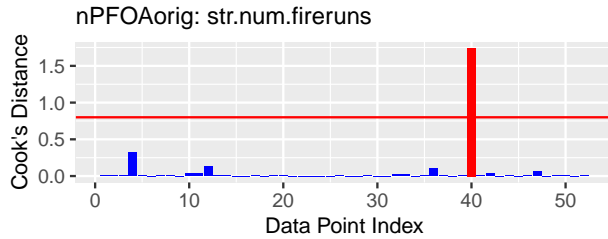


DFBETA Influence Measure on total.num.fireruns  
with Cutoff at 1  
nPFOAtrans: total.num.fireruns

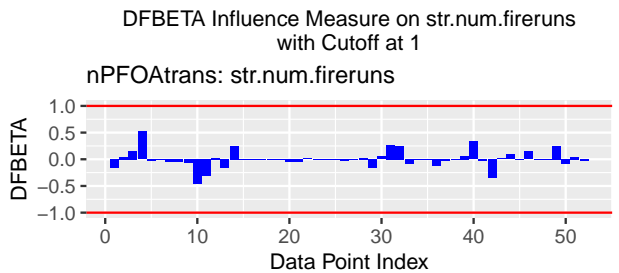
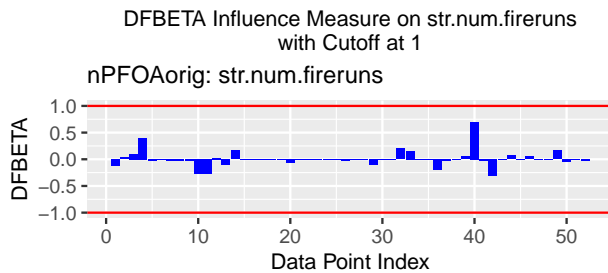
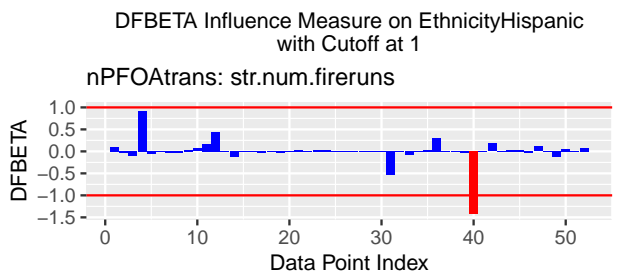
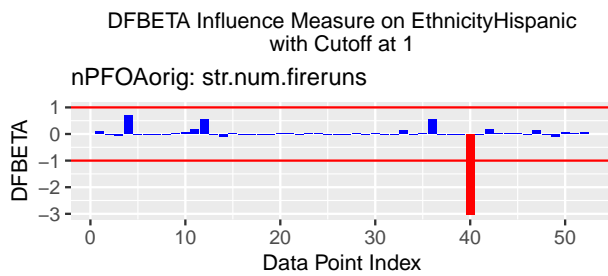
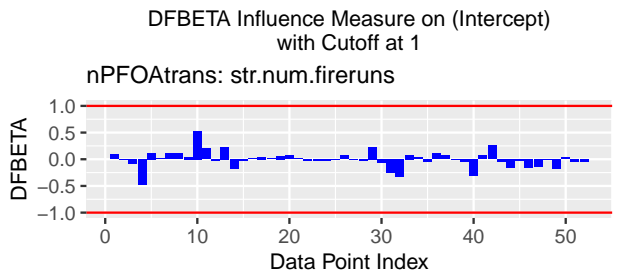
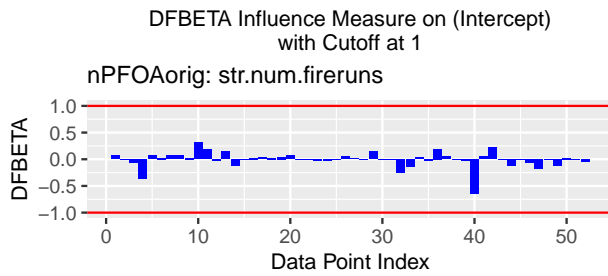
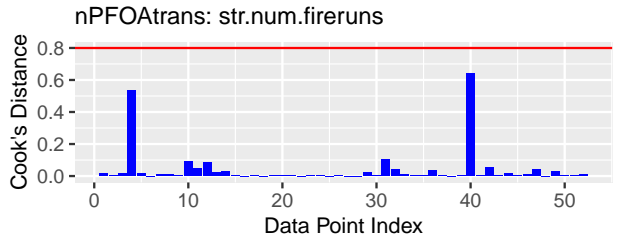




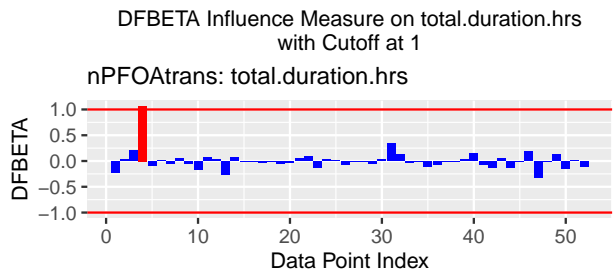
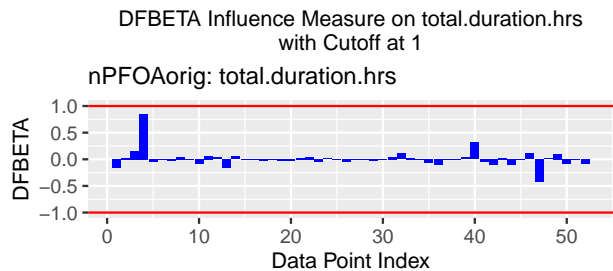
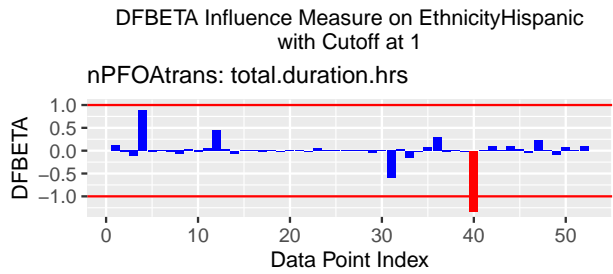
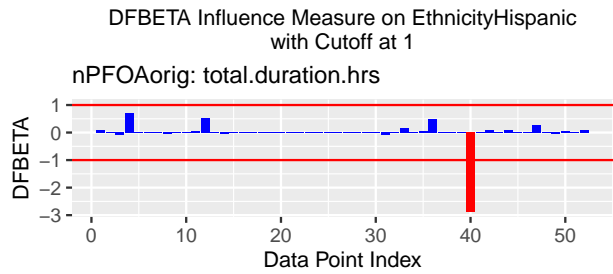
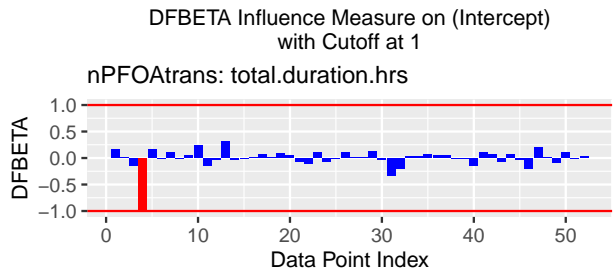
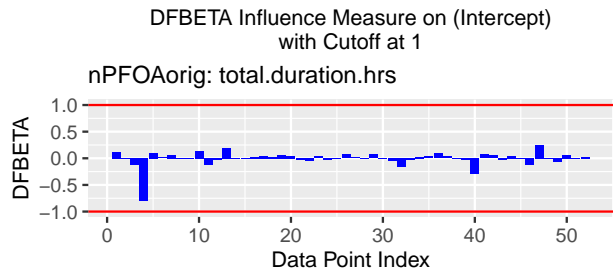
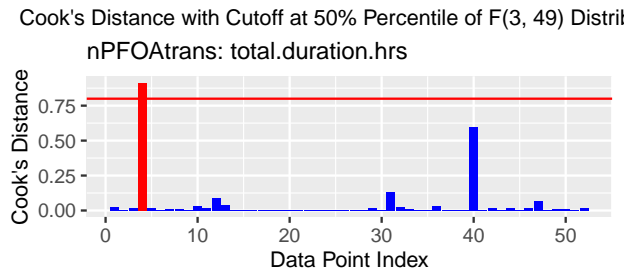
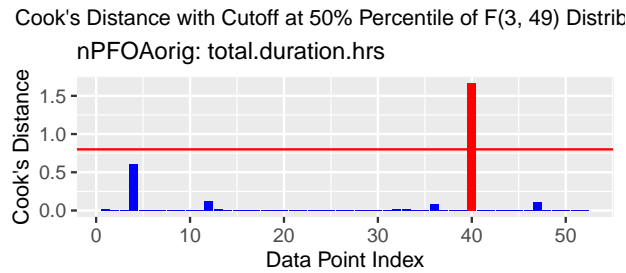
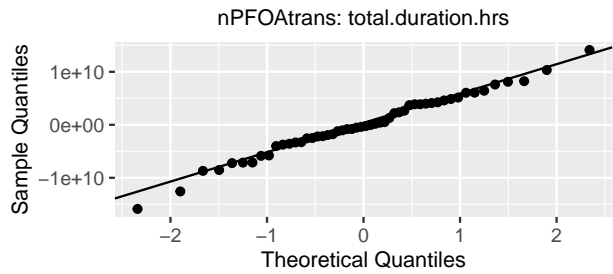
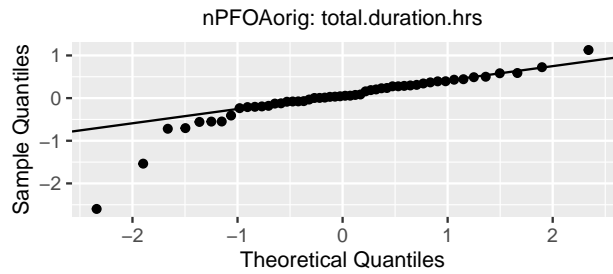
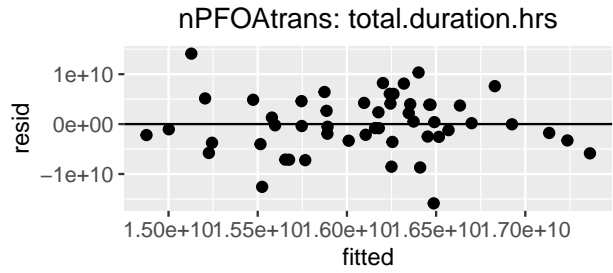
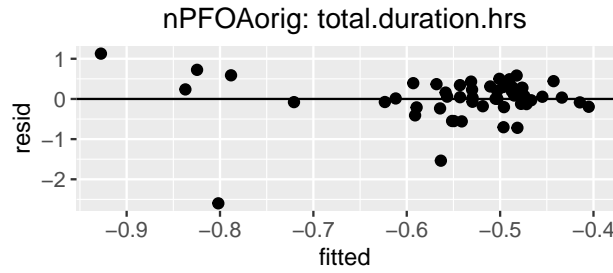
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

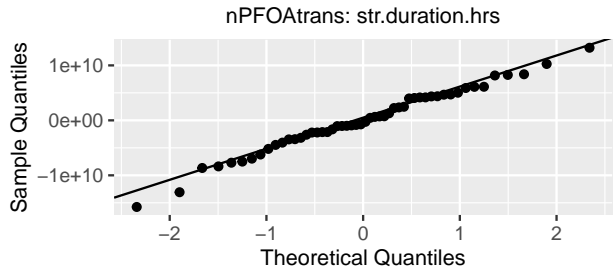
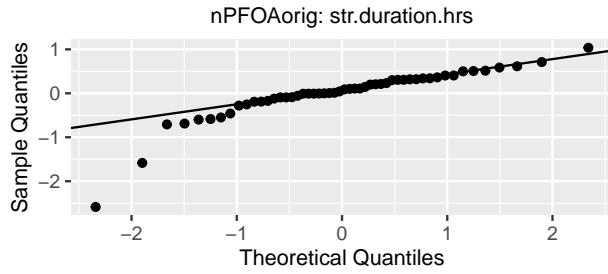
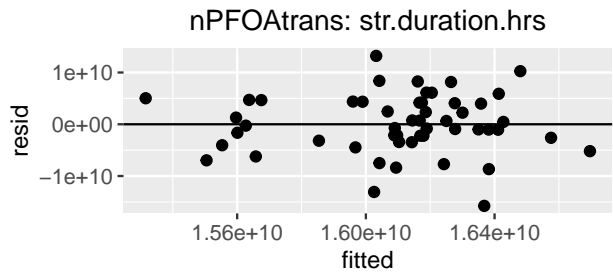
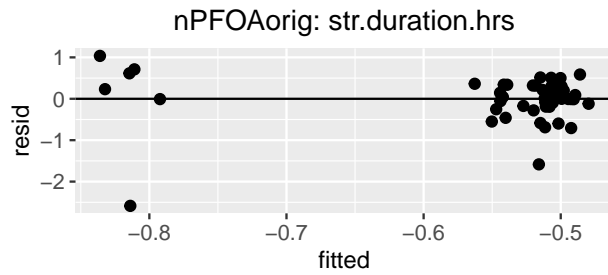


Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

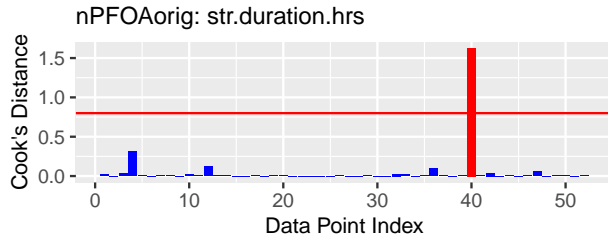




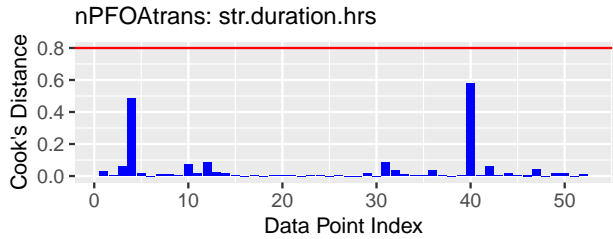




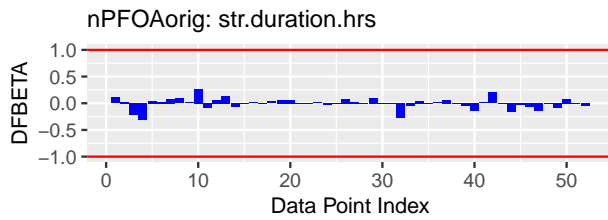
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib



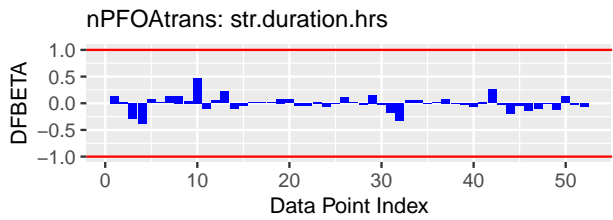
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib



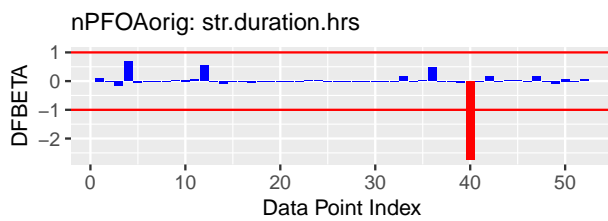
DFBETA Influence Measure on (Intercept) with Cutoff at 1



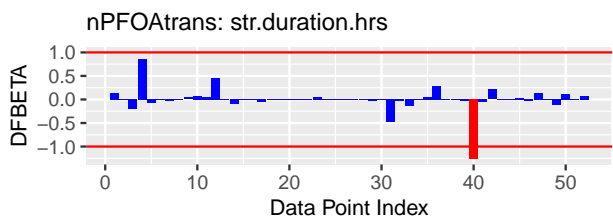
DFBETA Influence Measure on (Intercept) with Cutoff at 1



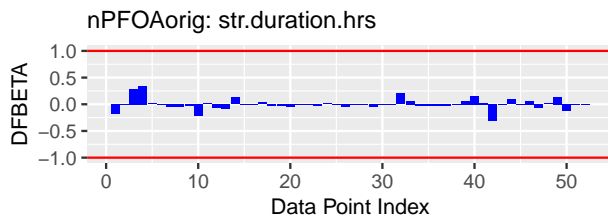
DFBETA Influence Measure on EthnicityHispanic with Cutoff at 1



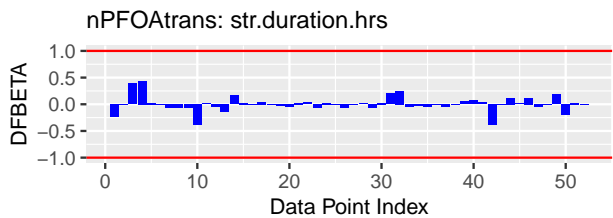
DFBETA Influence Measure on EthnicityHispanic with Cutoff at 1

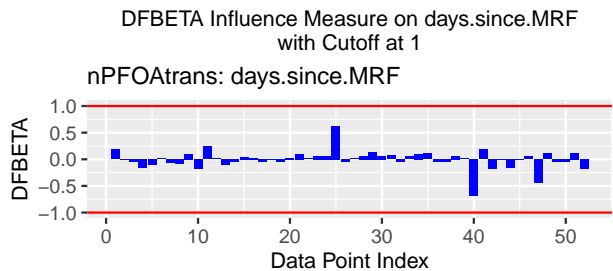
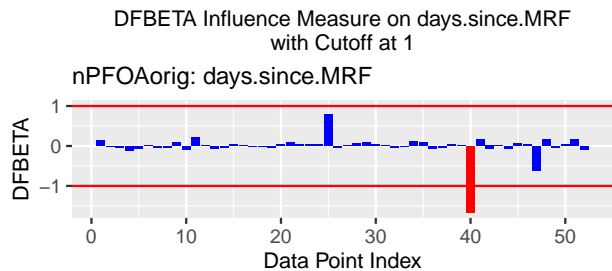
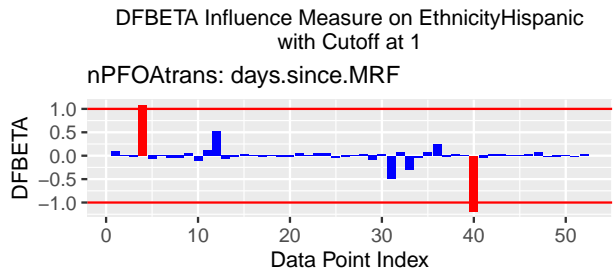
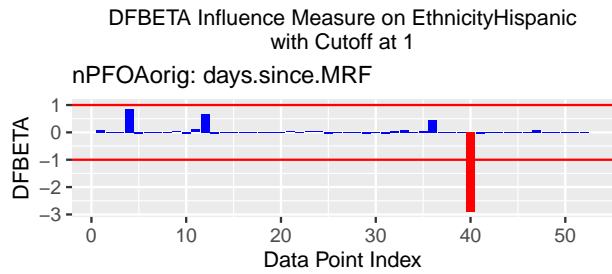
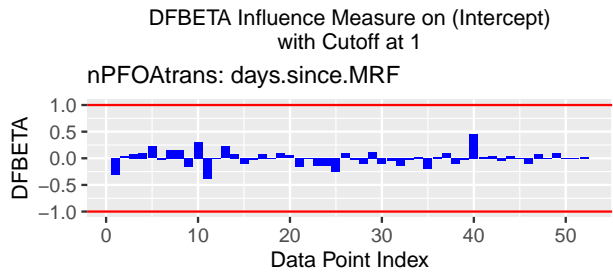
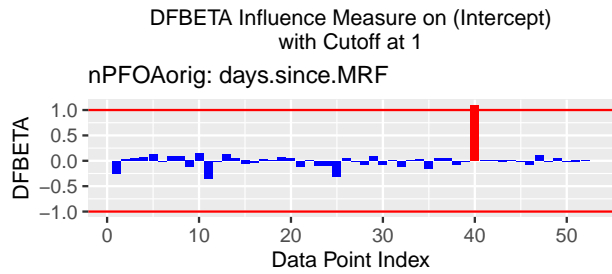
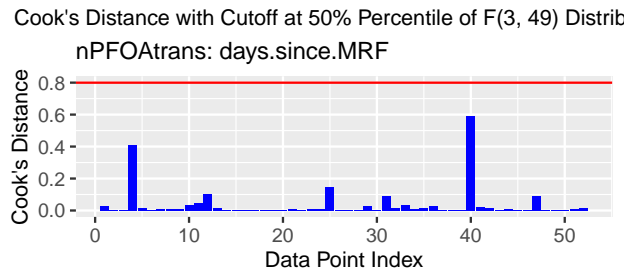
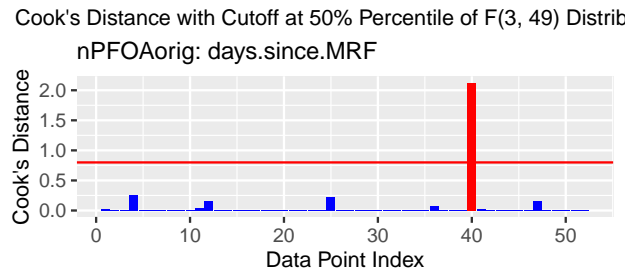
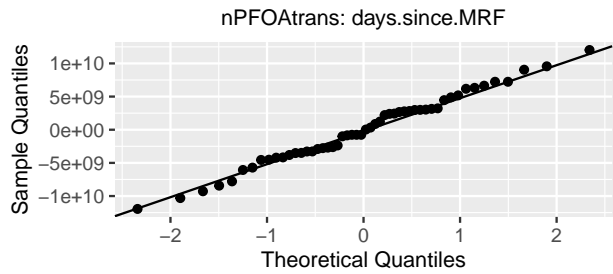
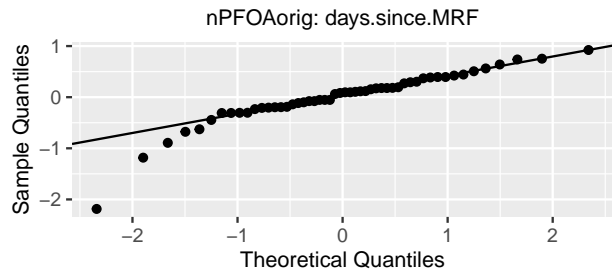
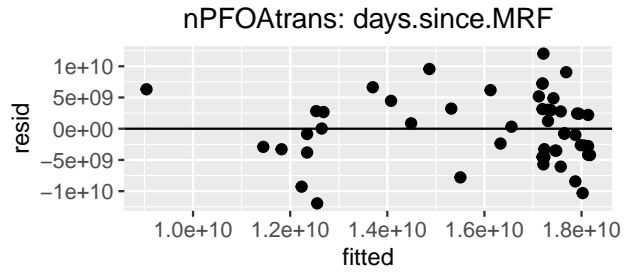
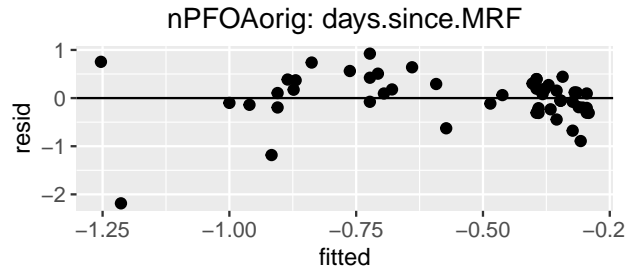


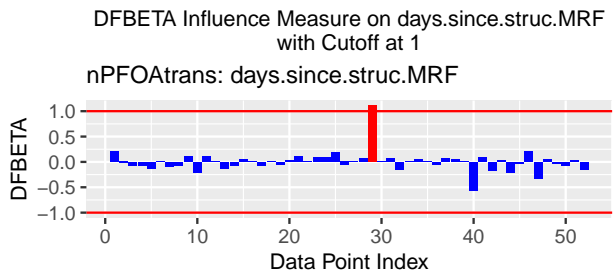
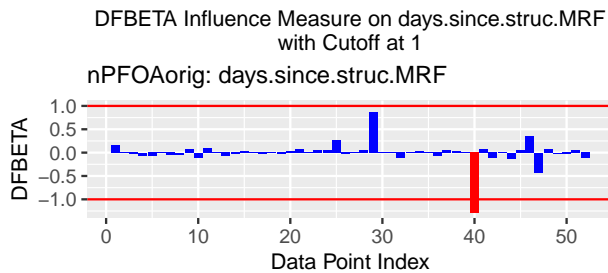
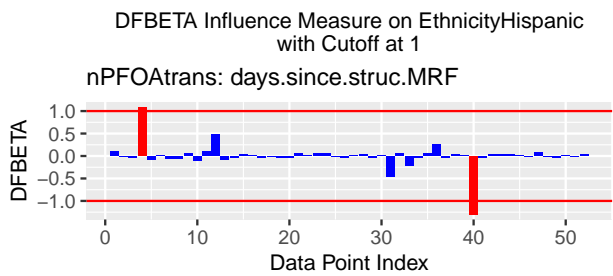
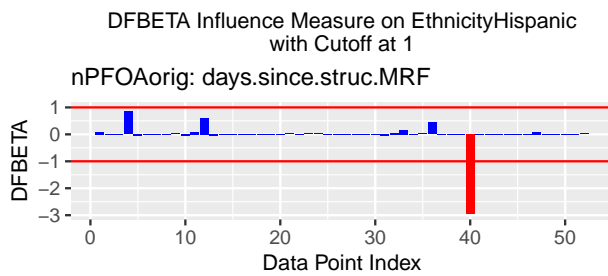
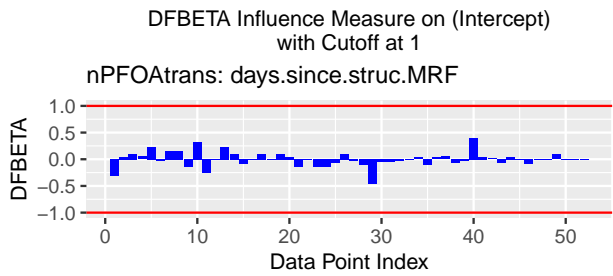
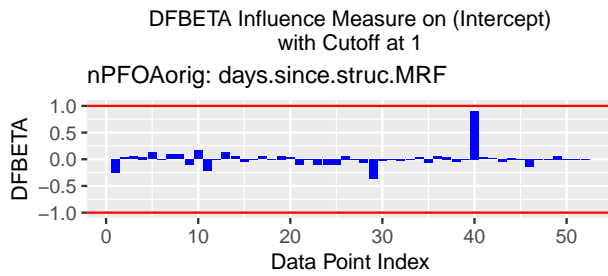
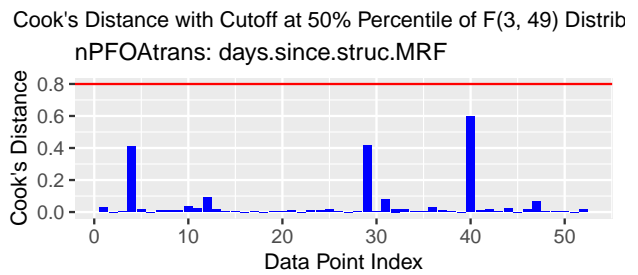
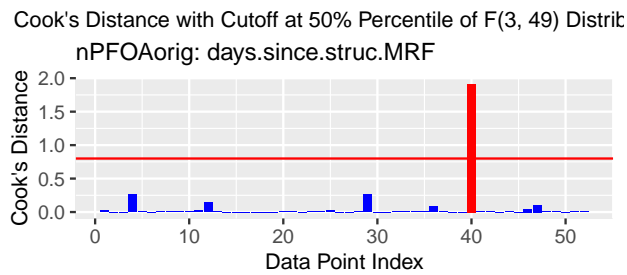
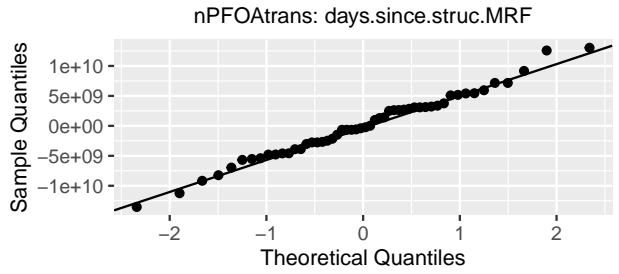
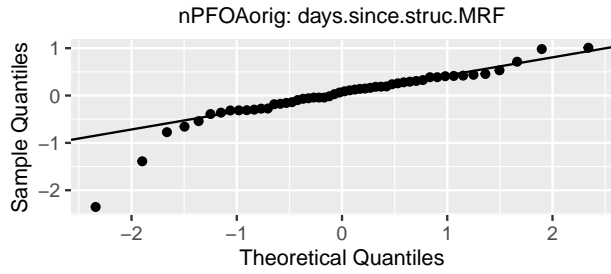
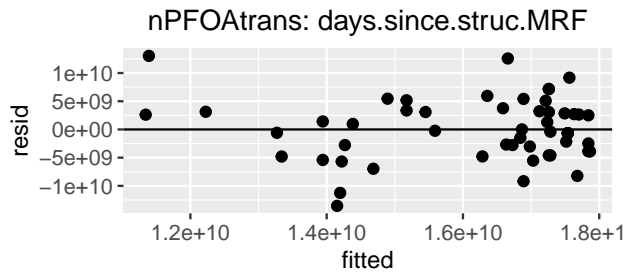
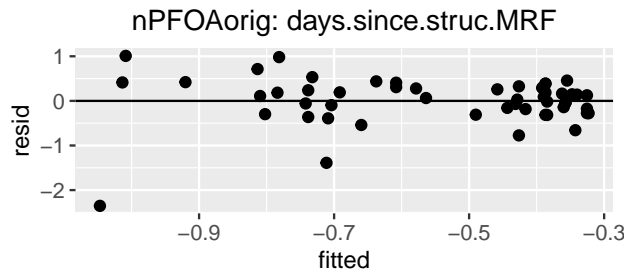
DFBETA Influence Measure on str.duration.hrs with Cutoff at 1

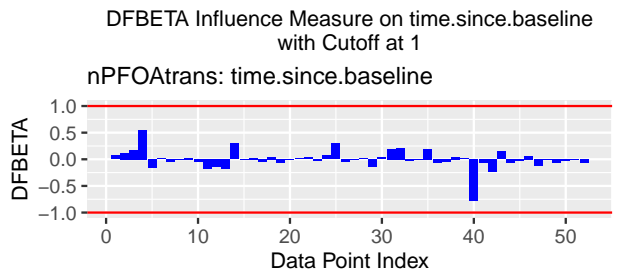
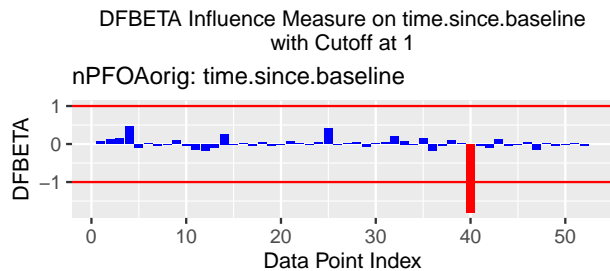
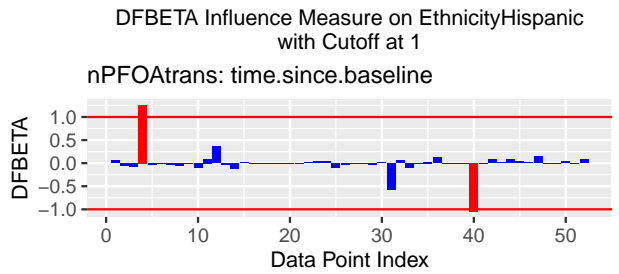
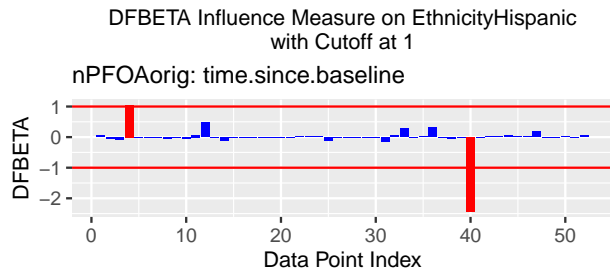
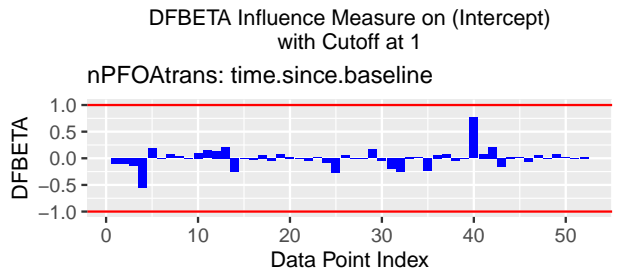
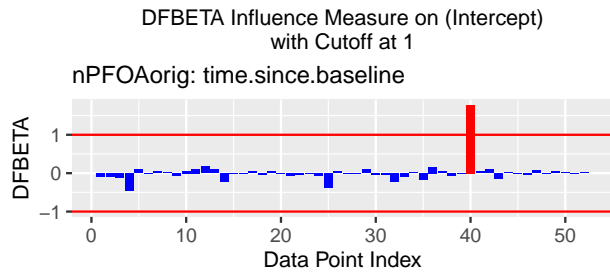
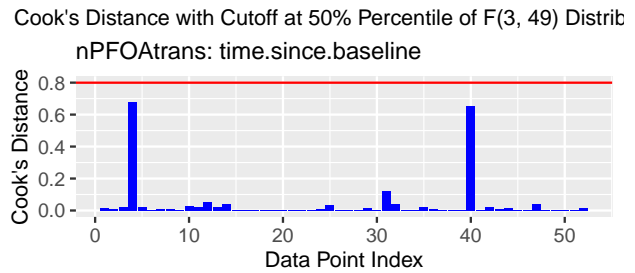
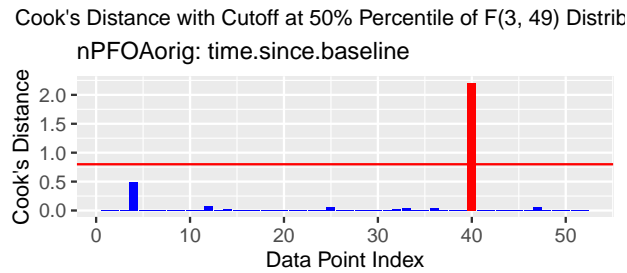
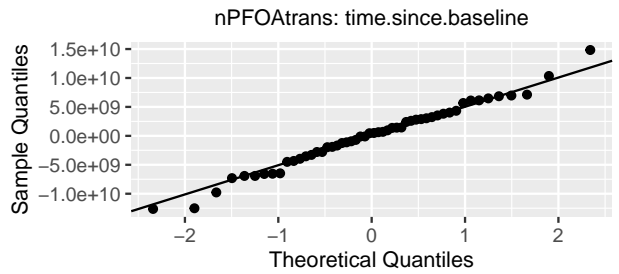
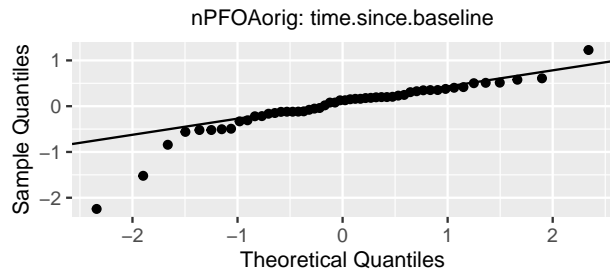
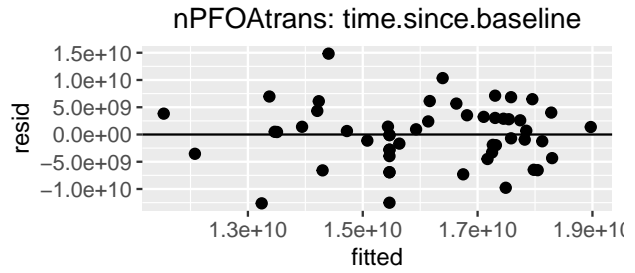
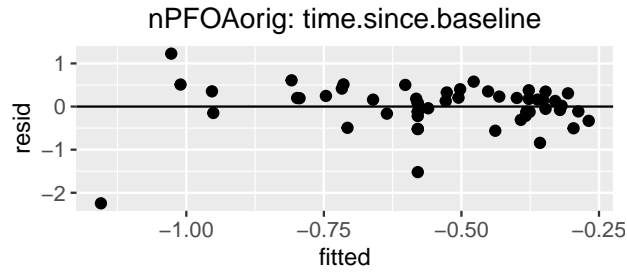


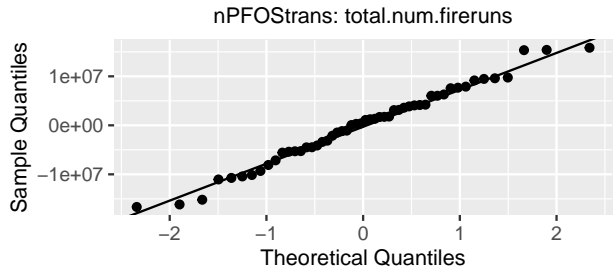
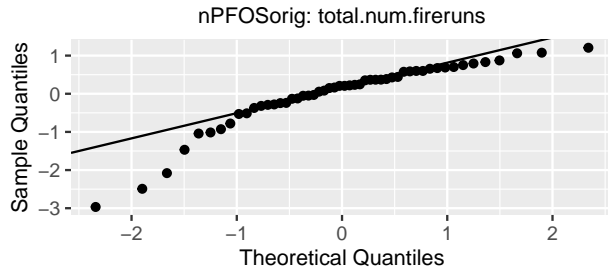
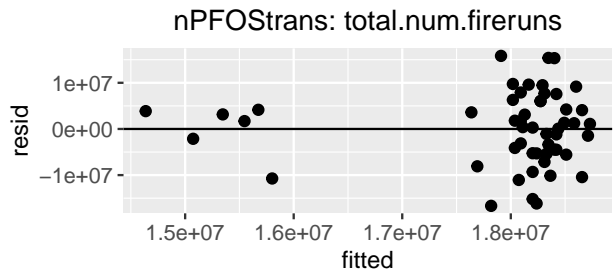
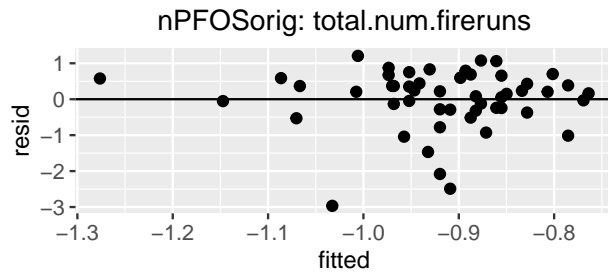
DFBETA Influence Measure on str.duration.hrs with Cutoff at 1





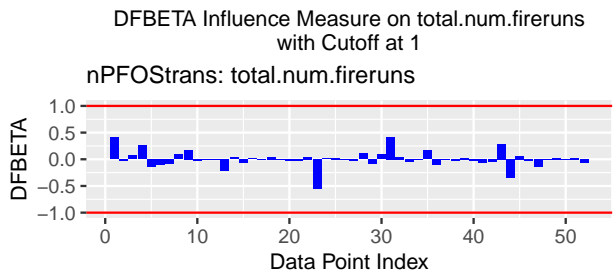
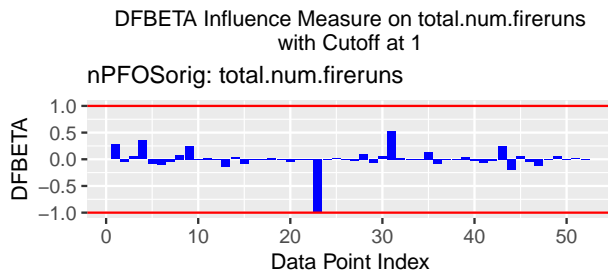
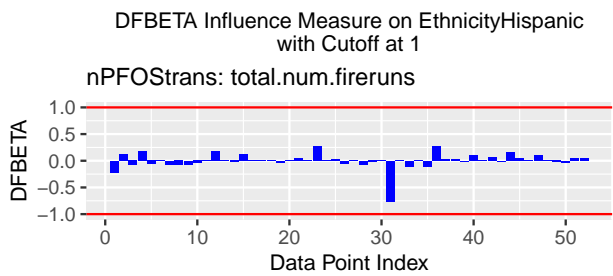
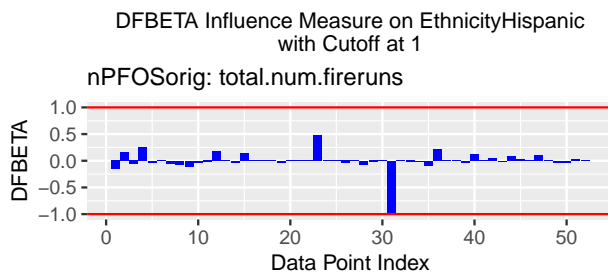
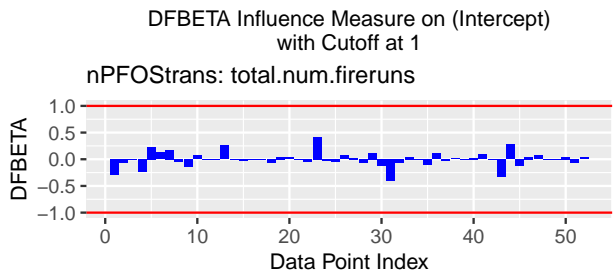
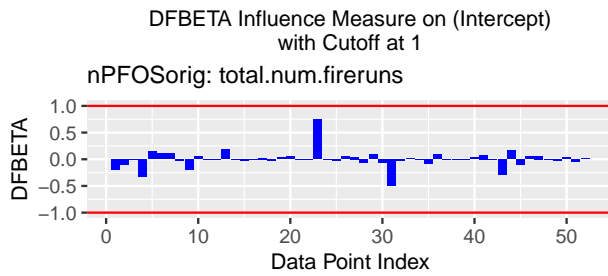
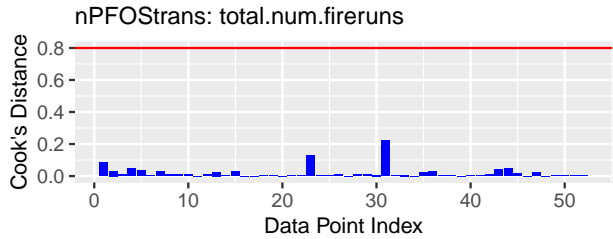
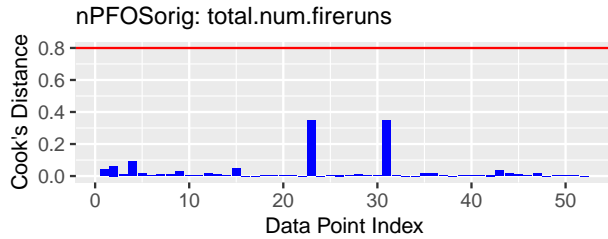


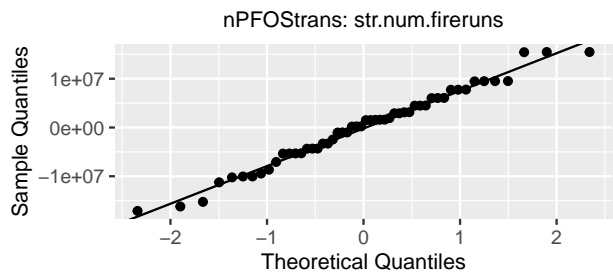
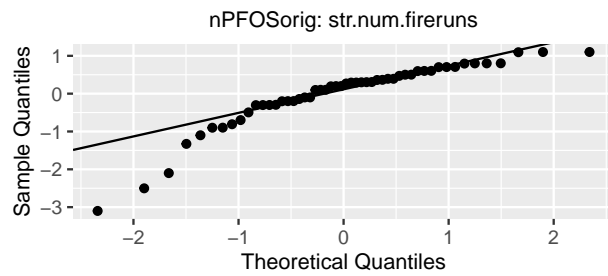
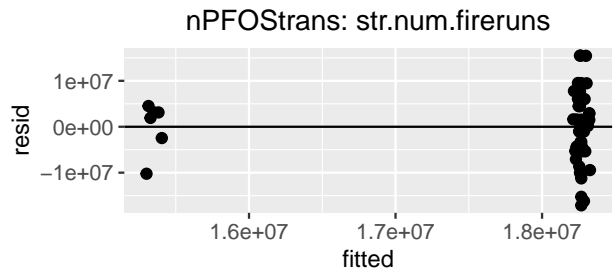
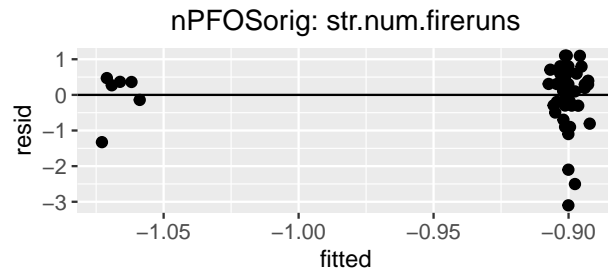




Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

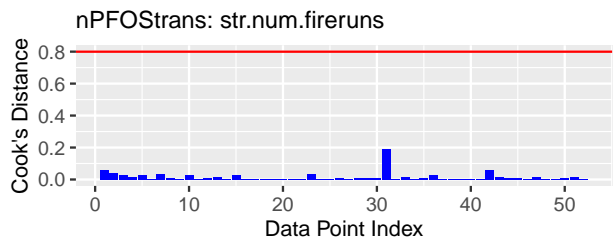
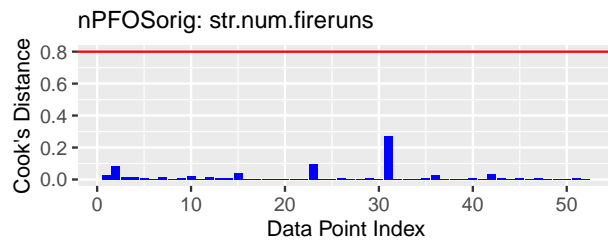
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib





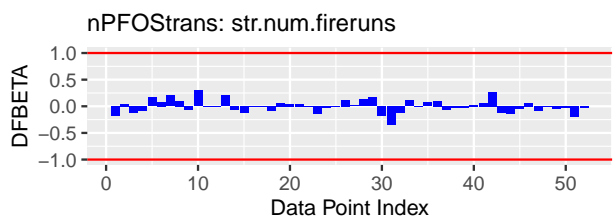
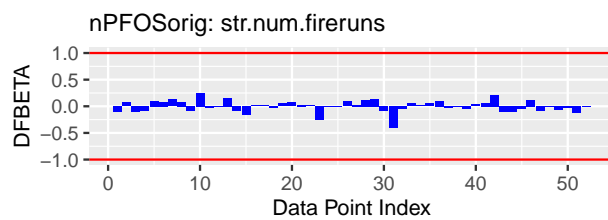
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib



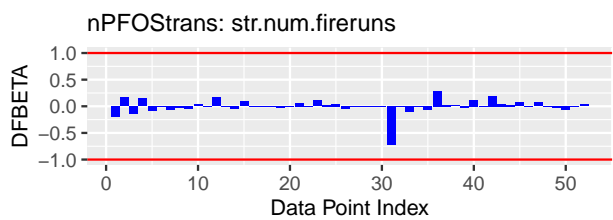
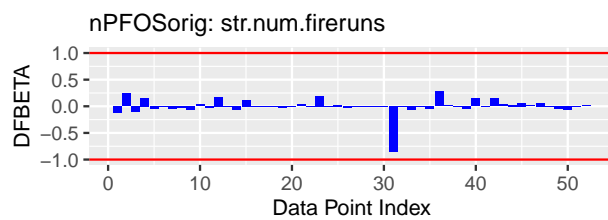
DFBETA Influence Measure on (Intercept)  
with Cutoff at 1

DFBETA Influence Measure on (Intercept)  
with Cutoff at 1



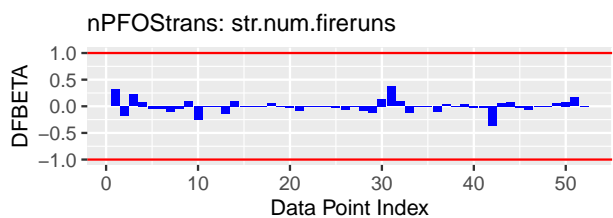
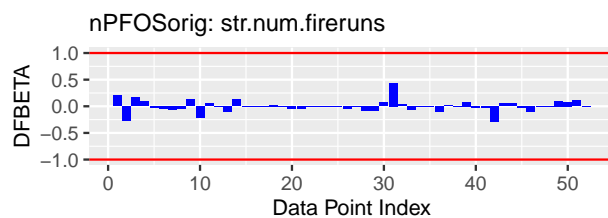
DFBETA Influence Measure on EthnicityHispanic  
with Cutoff at 1

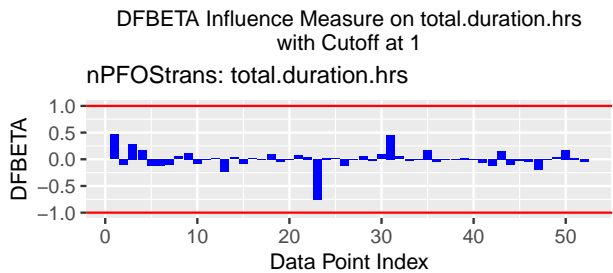
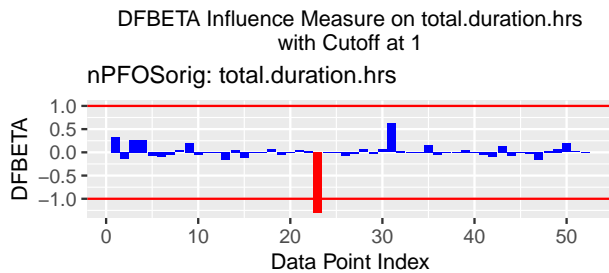
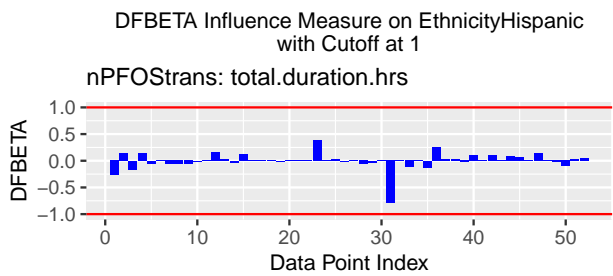
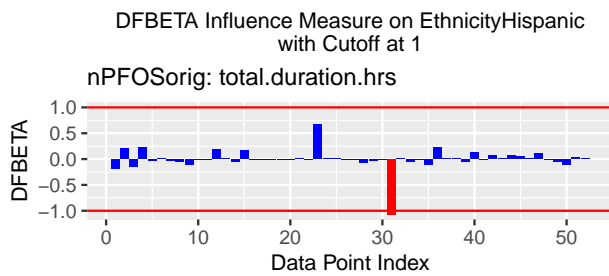
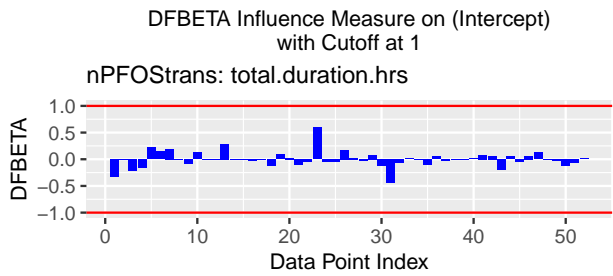
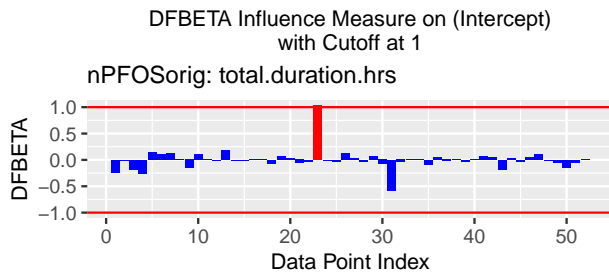
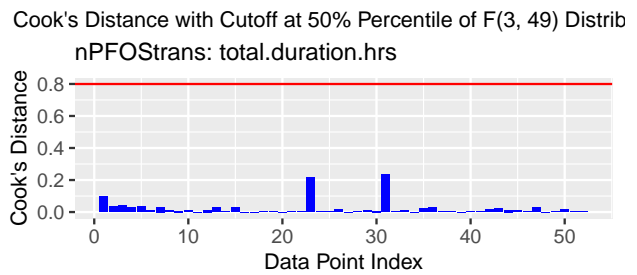
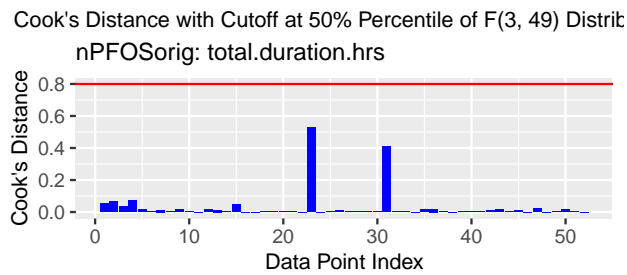
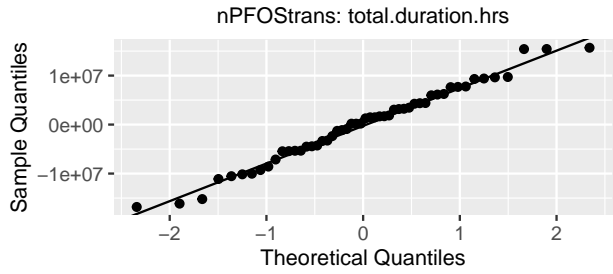
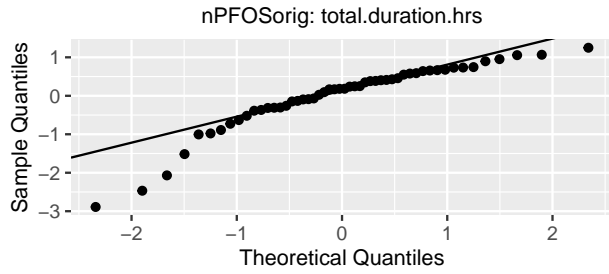
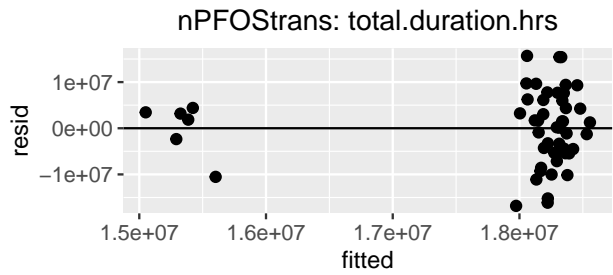
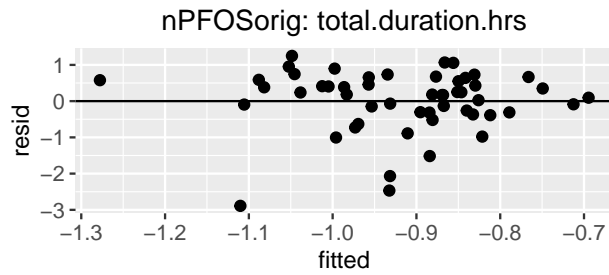
DFBETA Influence Measure on EthnicityHispanic  
with Cutoff at 1



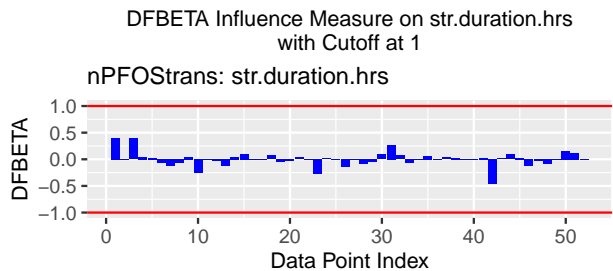
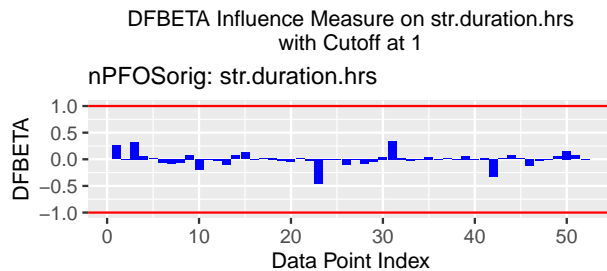
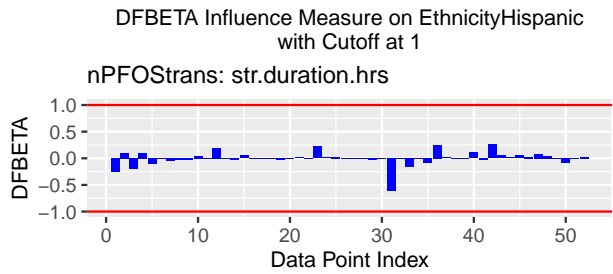
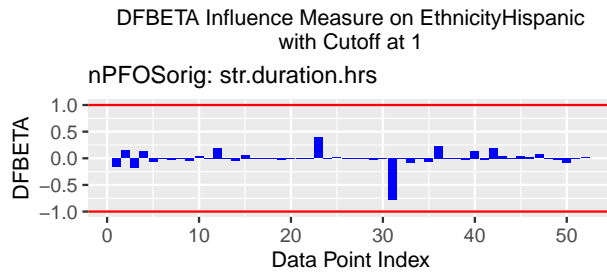
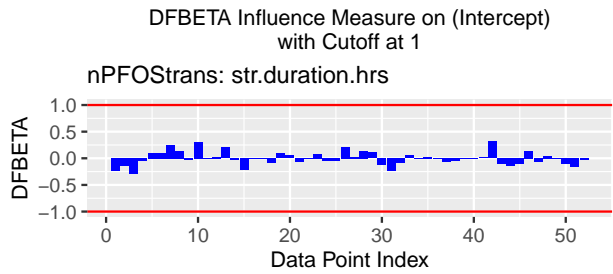
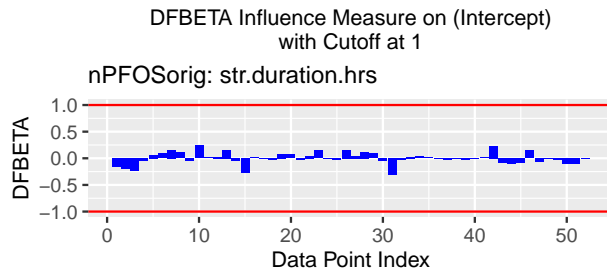
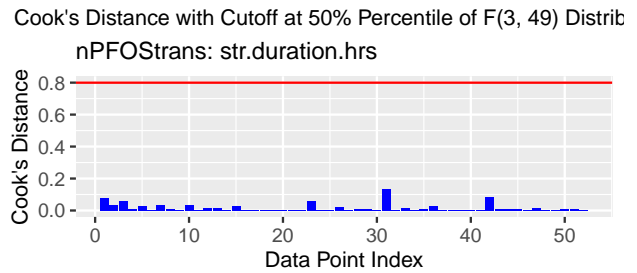
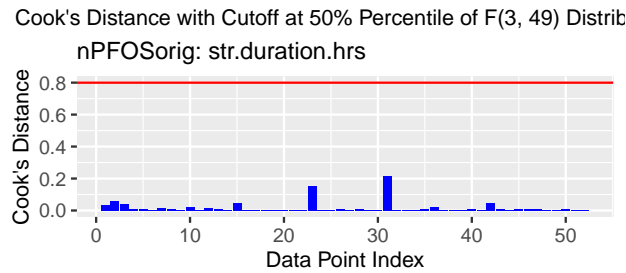
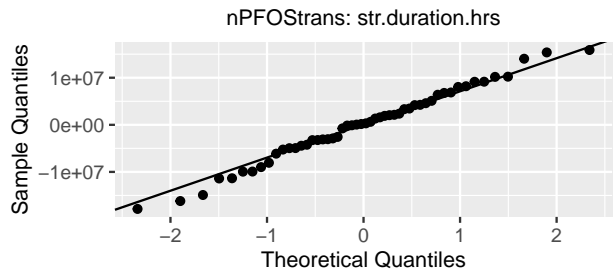
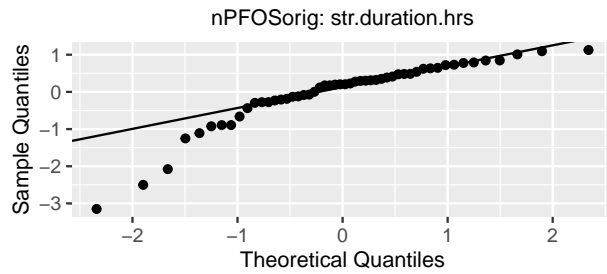
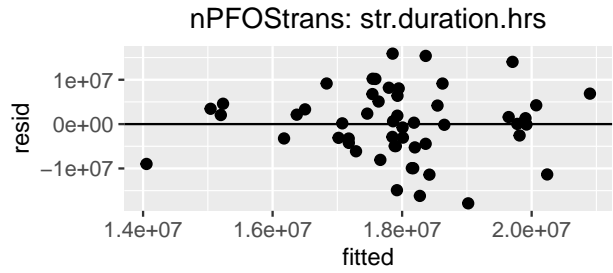
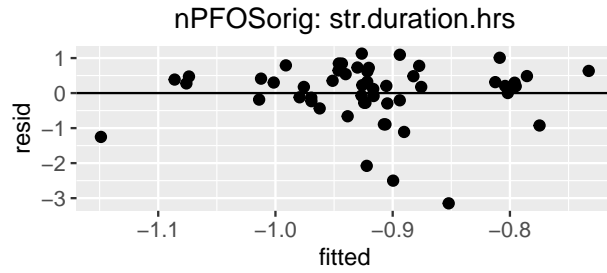
DFBETA Influence Measure on str.num.fireruns  
with Cutoff at 1

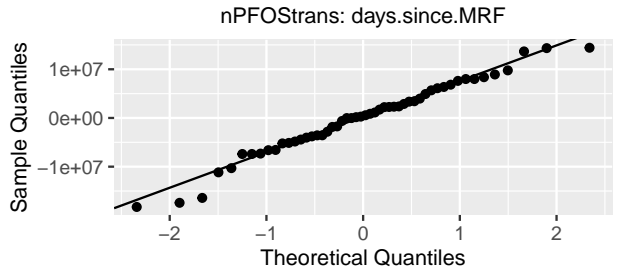
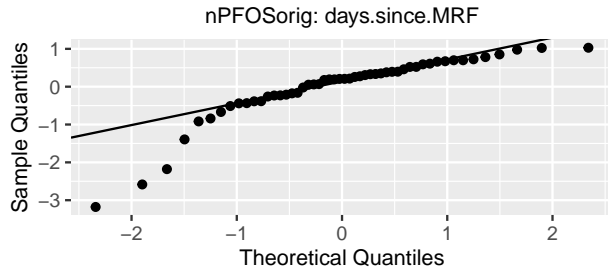
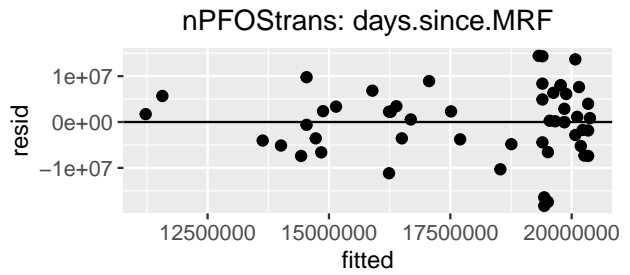
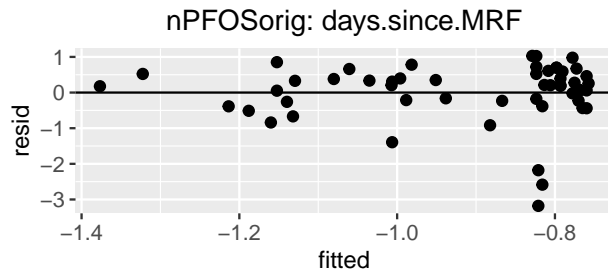
DFBETA Influence Measure on str.num.fireruns  
with Cutoff at 1



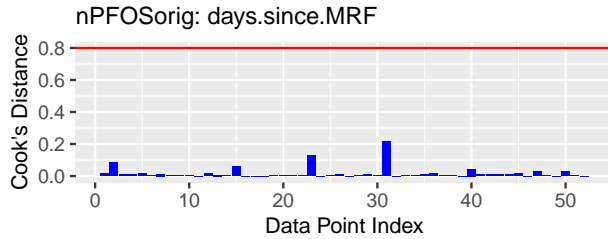




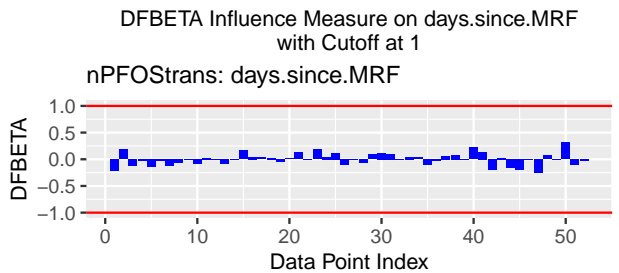
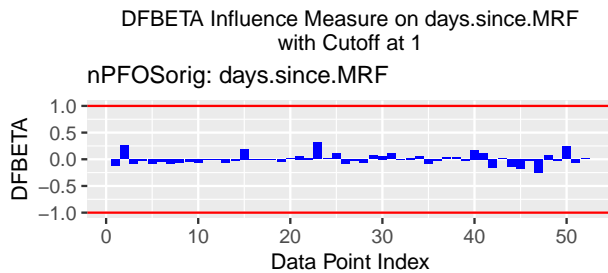
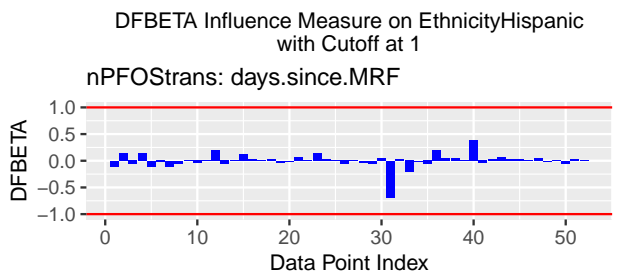
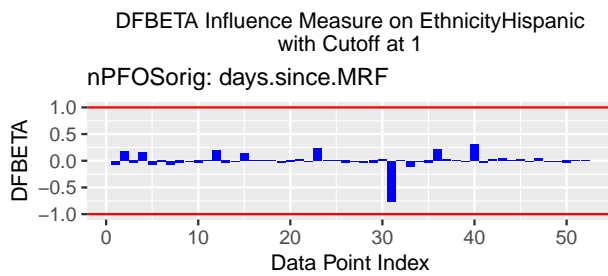
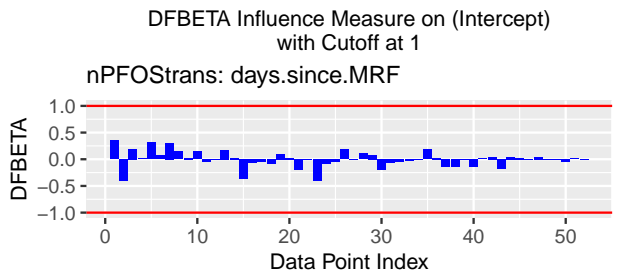
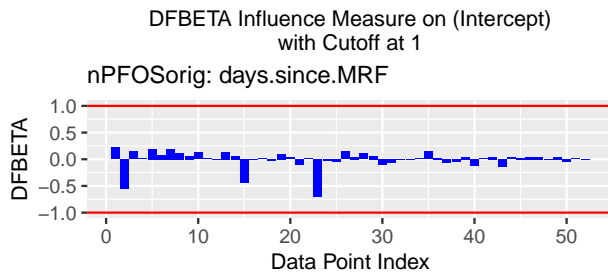
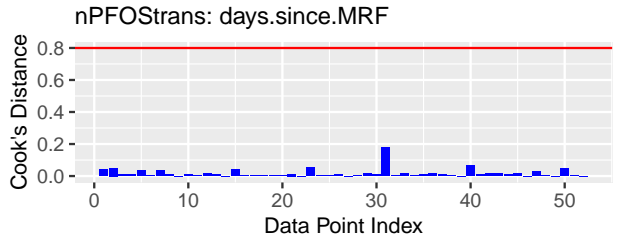


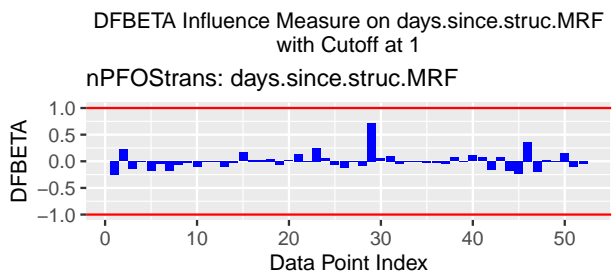
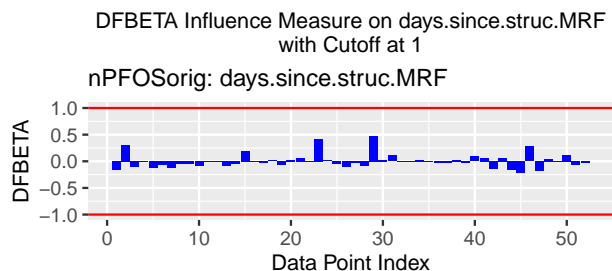
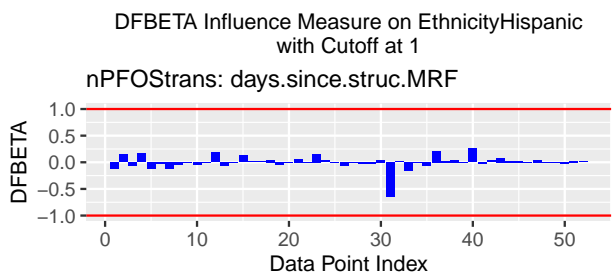
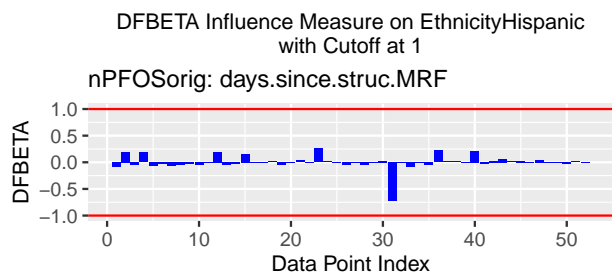
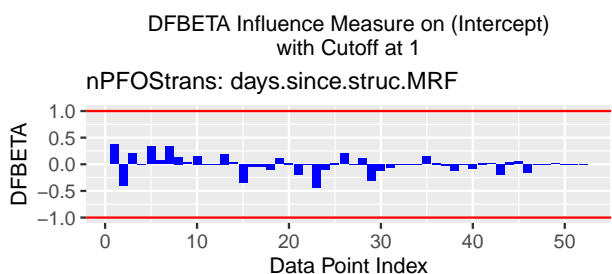
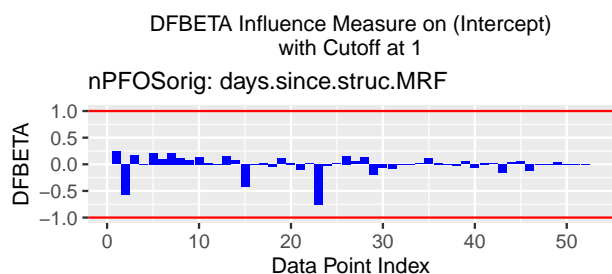
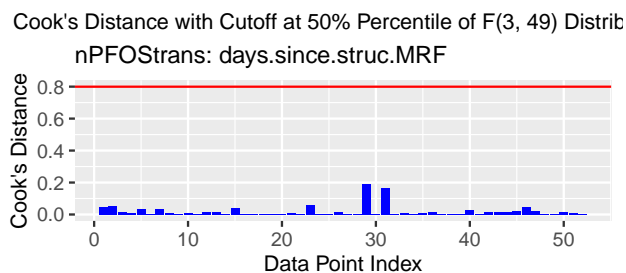
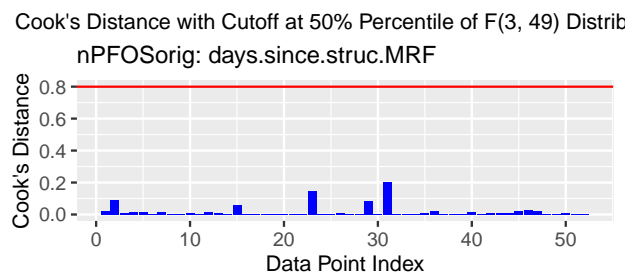
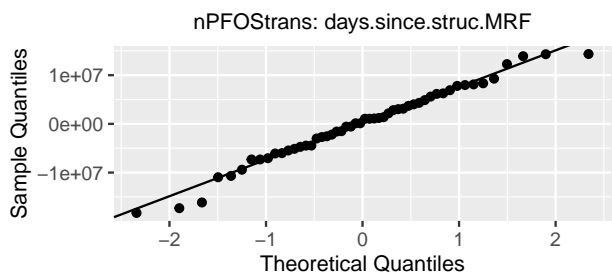
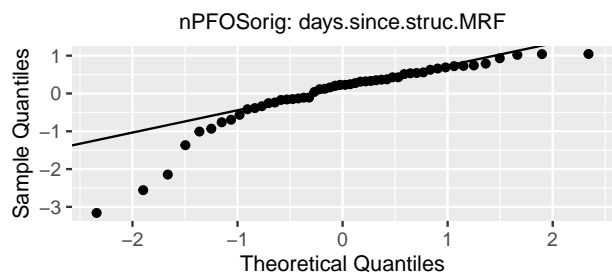
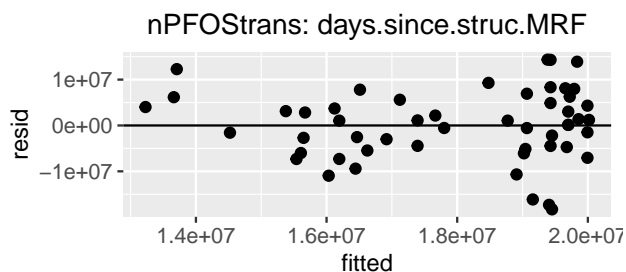
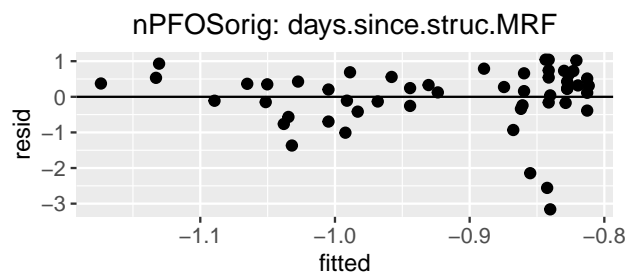


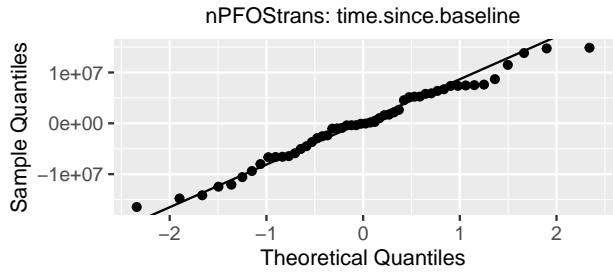
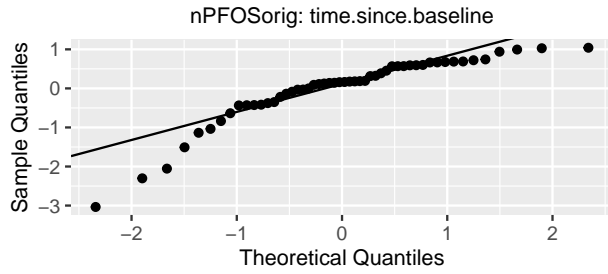
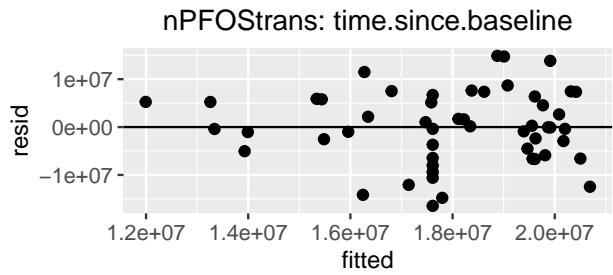
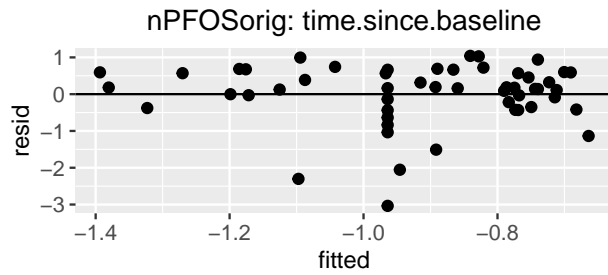
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib



Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

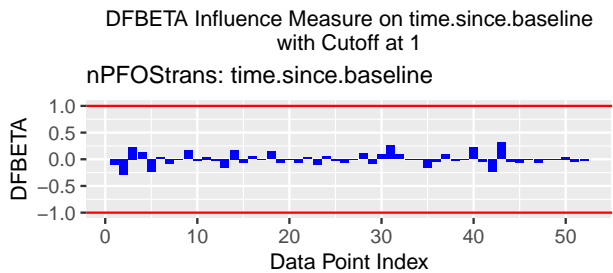
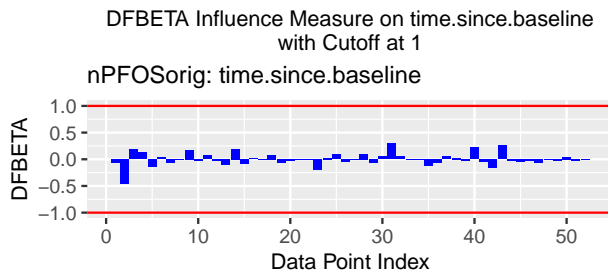
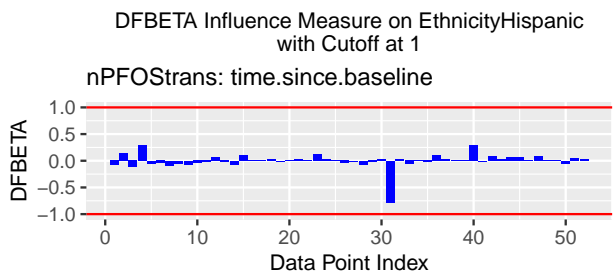
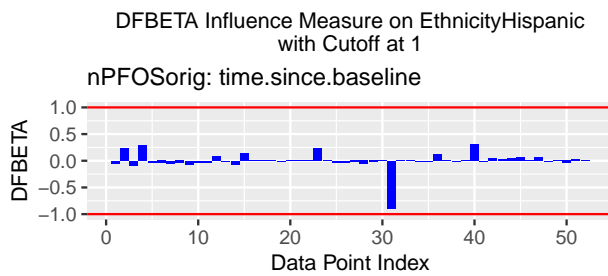
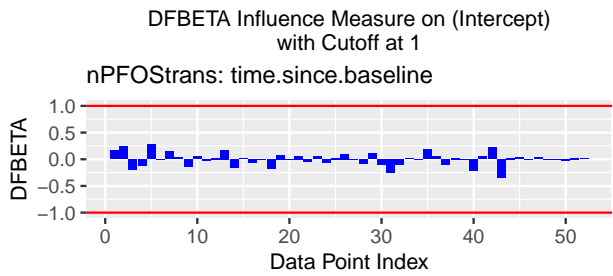
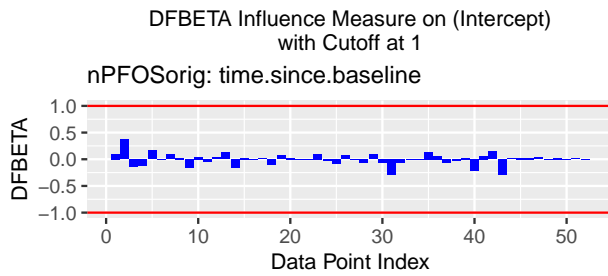
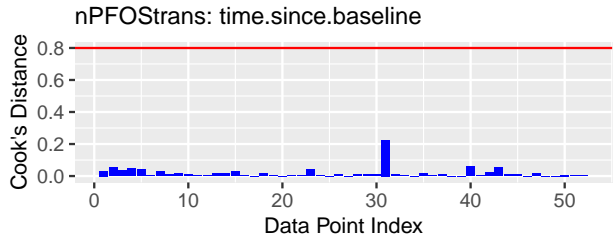
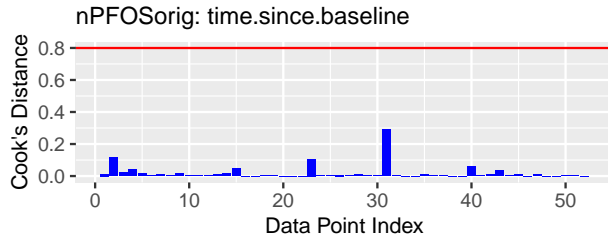


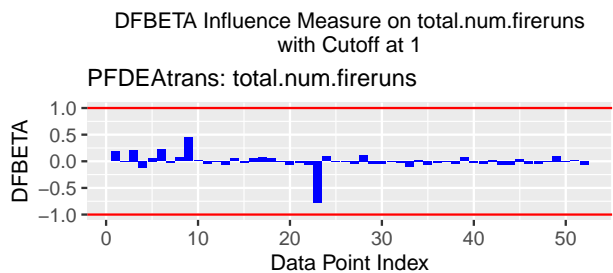
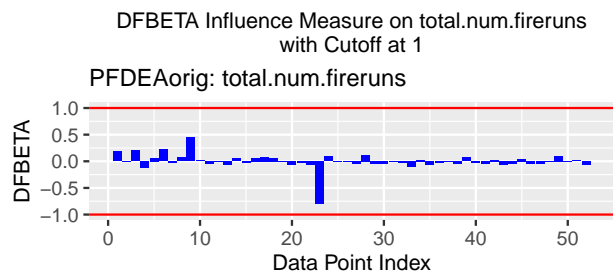
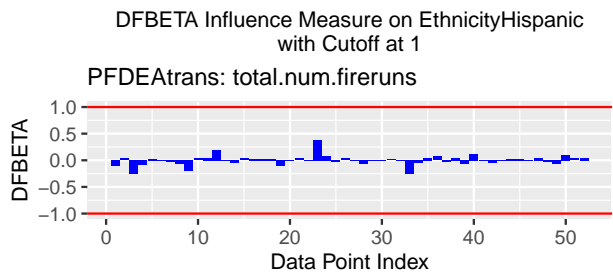
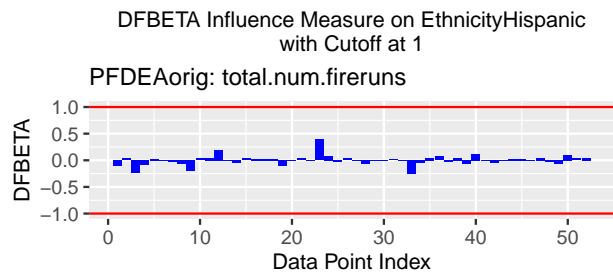
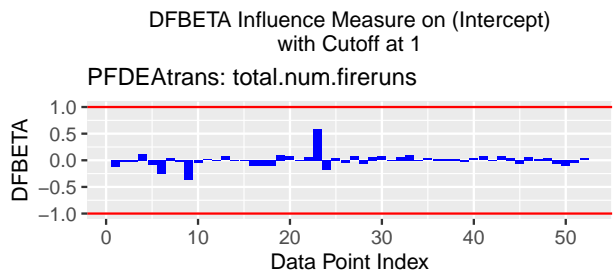
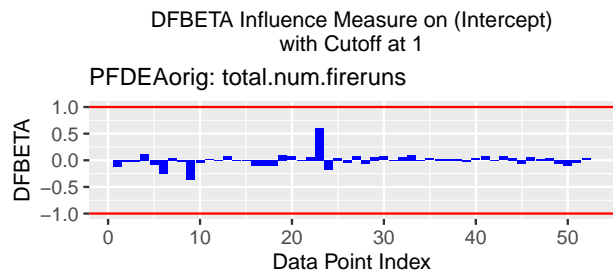
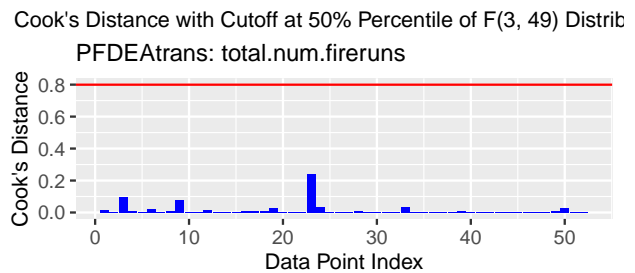
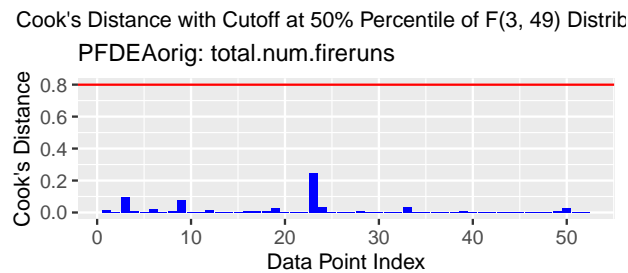
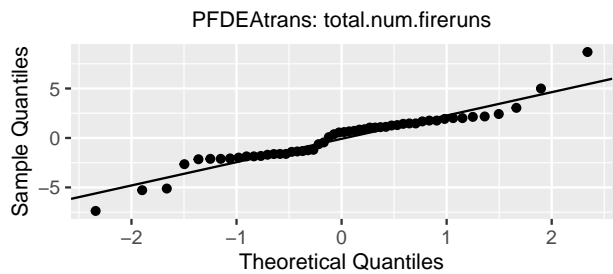
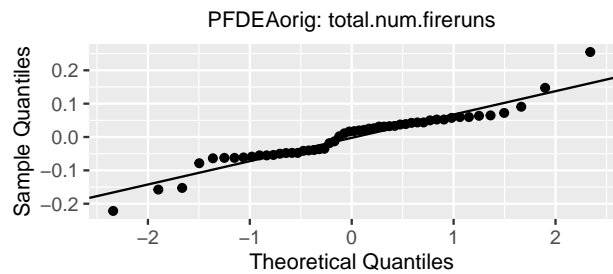
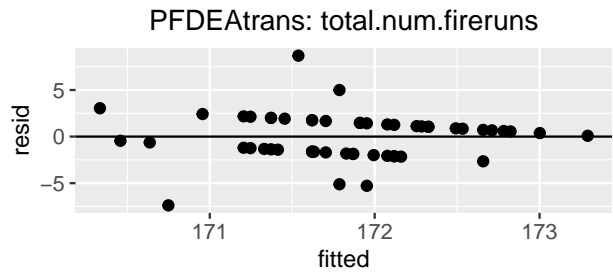
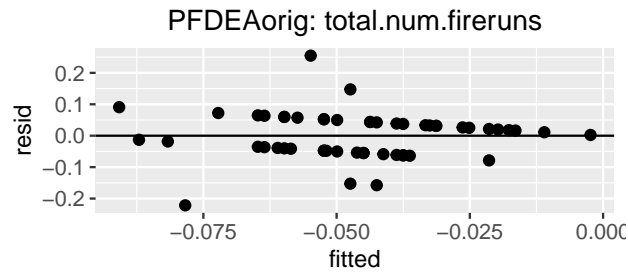


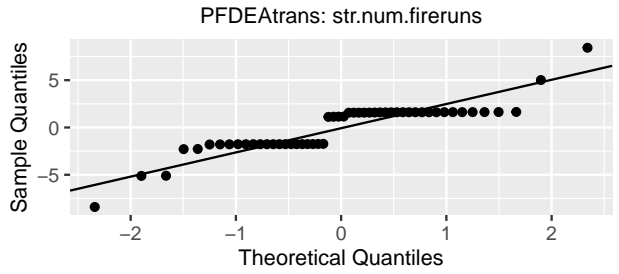
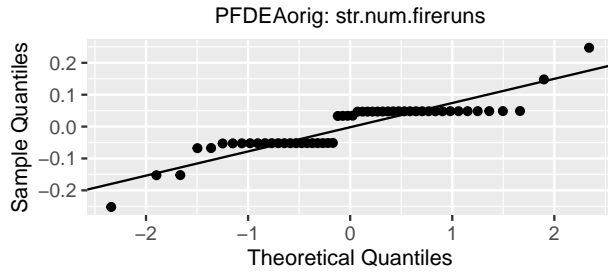
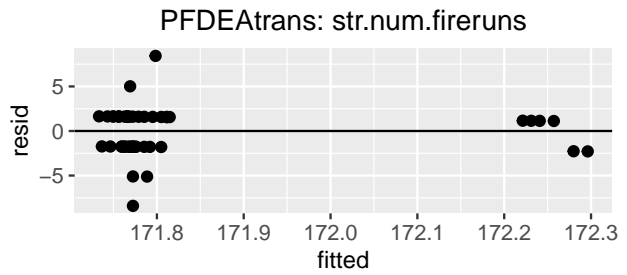
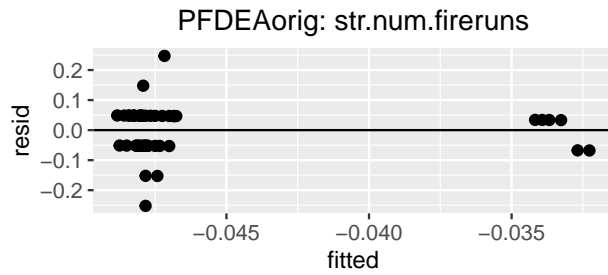


Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

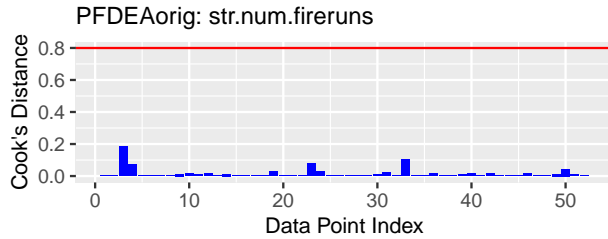
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib



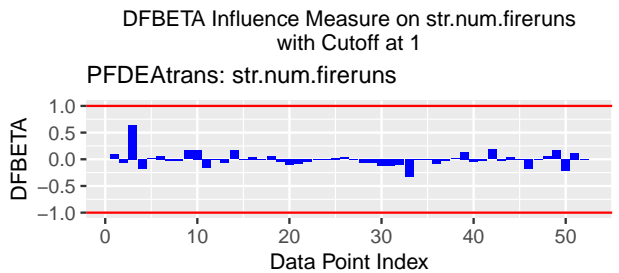
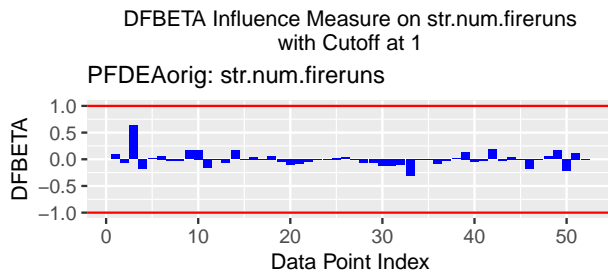
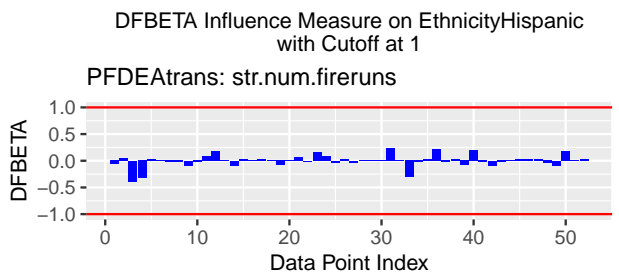
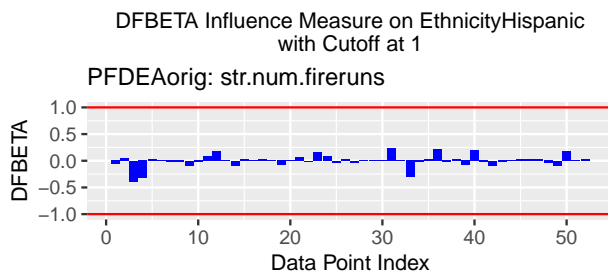
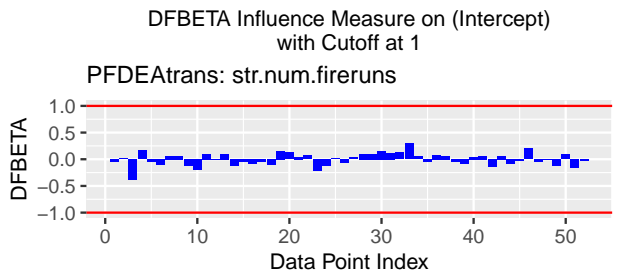
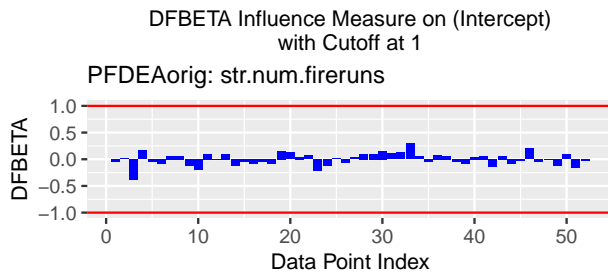
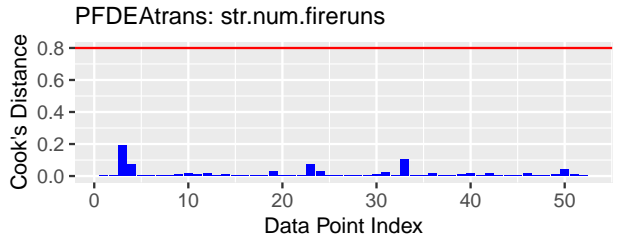


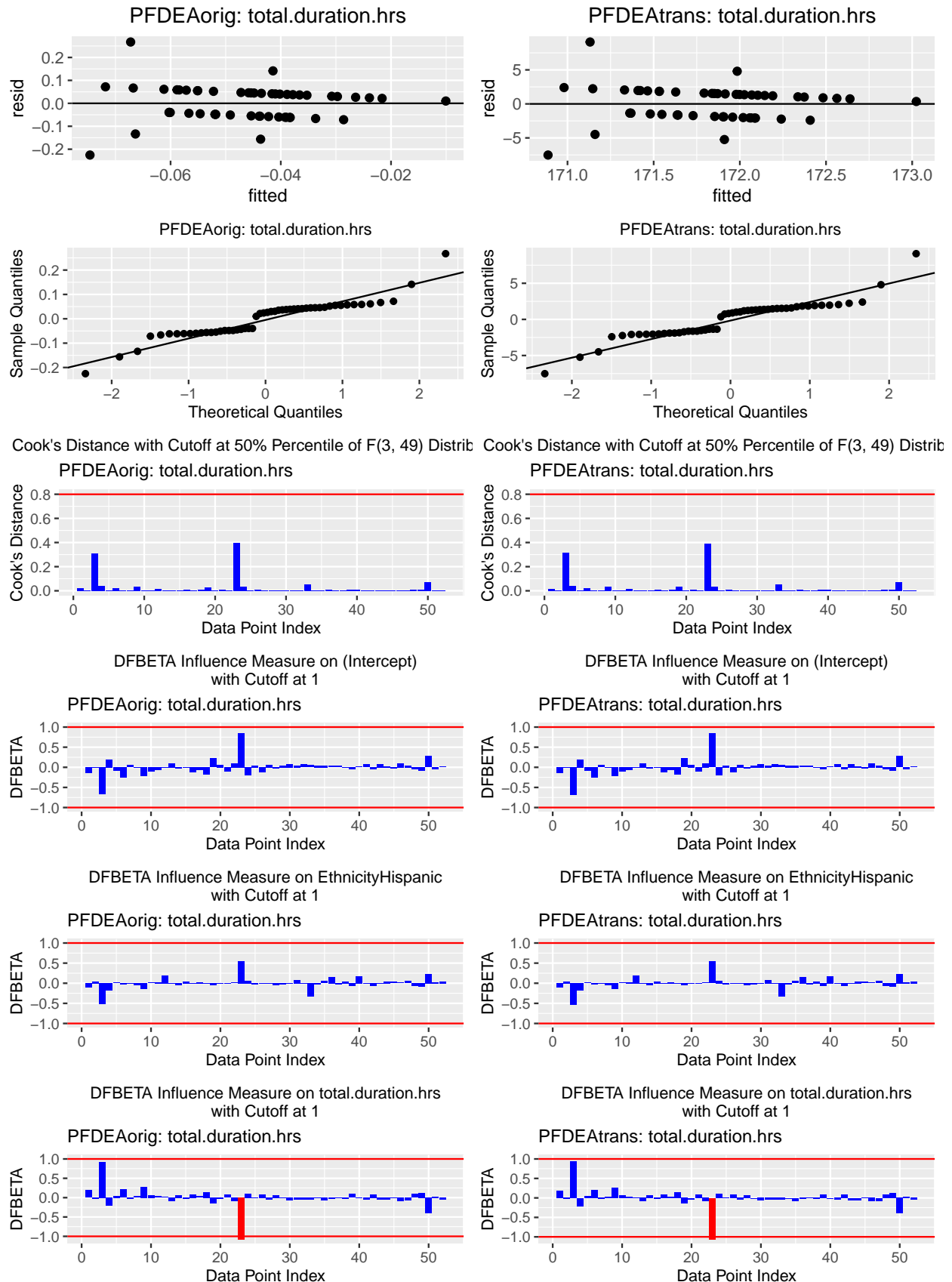


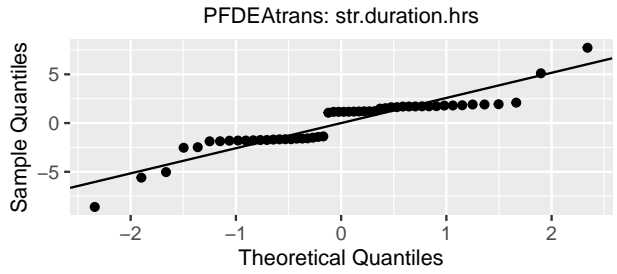
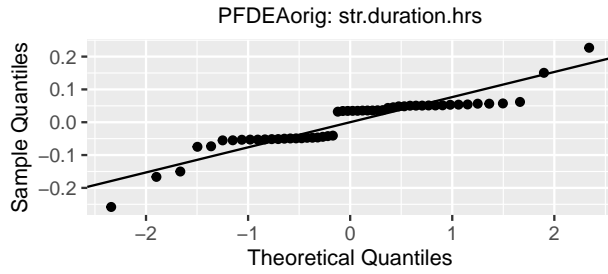
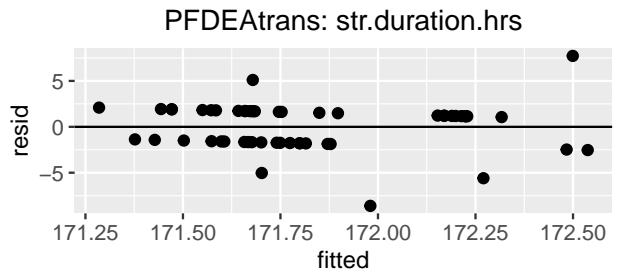
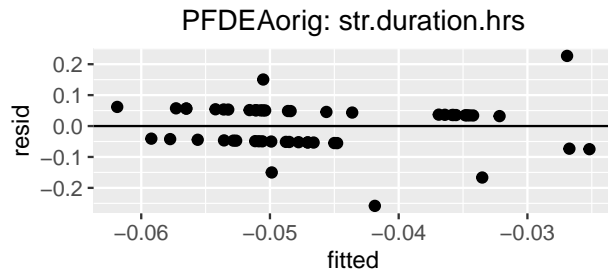
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib



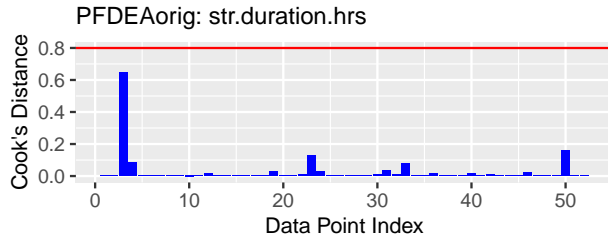
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib



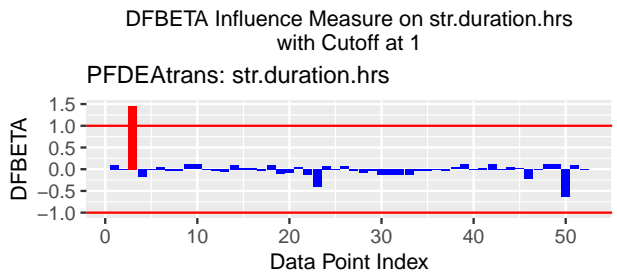
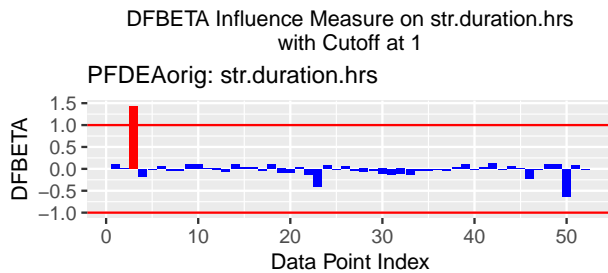
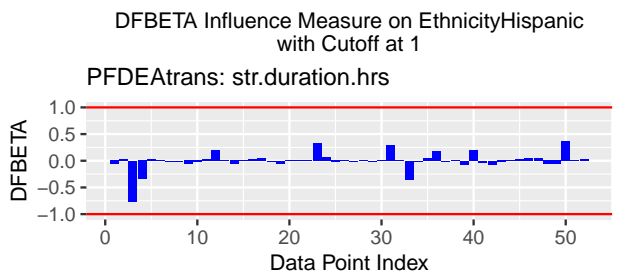
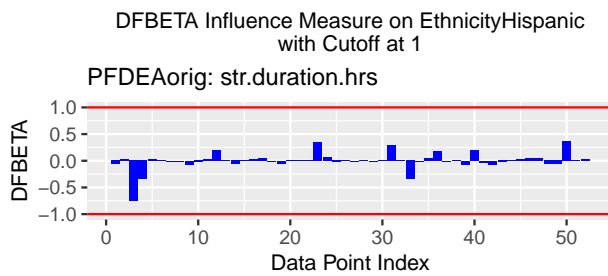
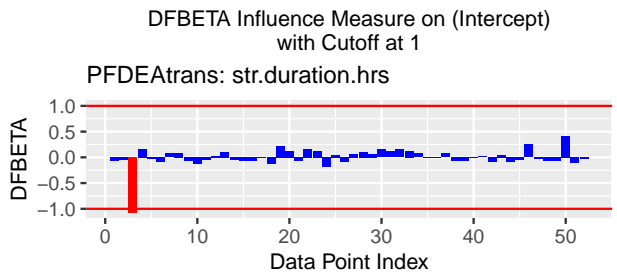
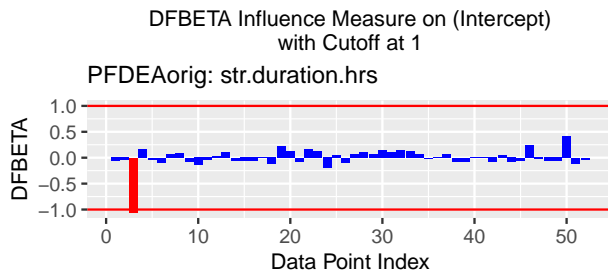
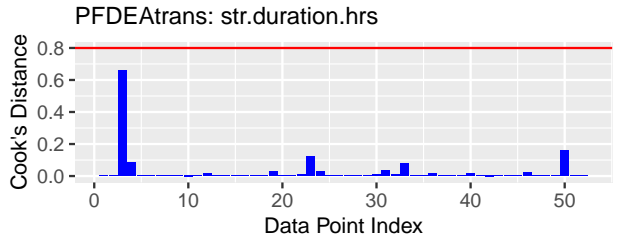




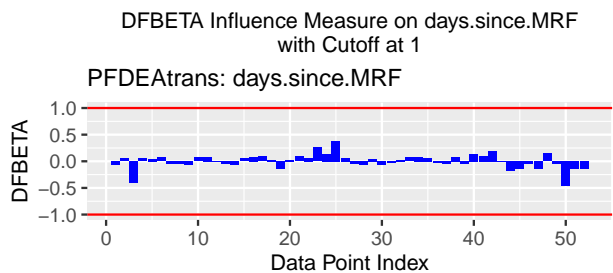
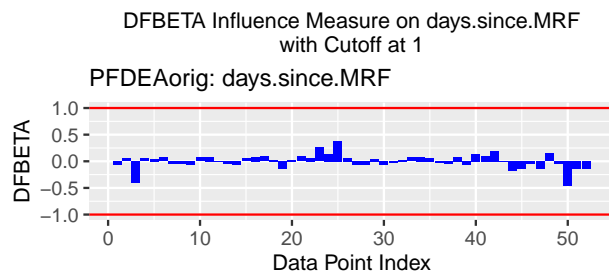
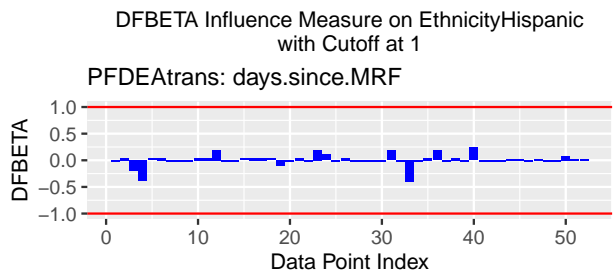
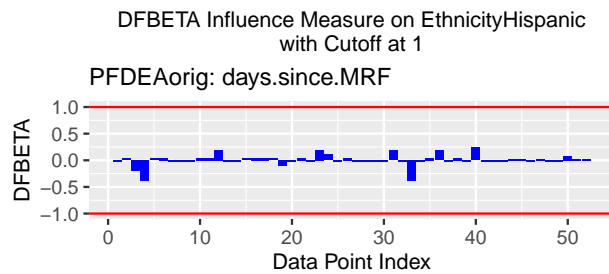
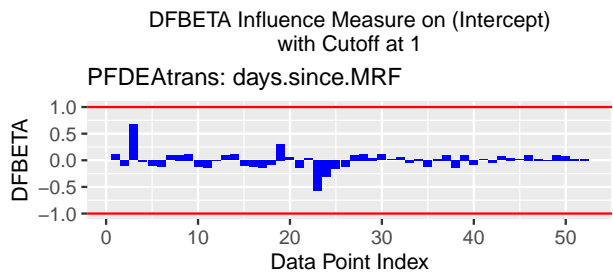
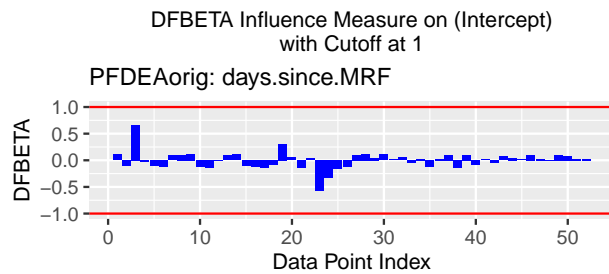
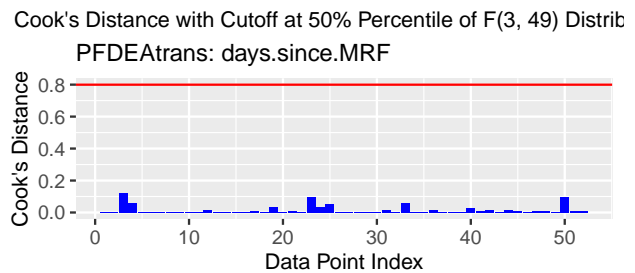
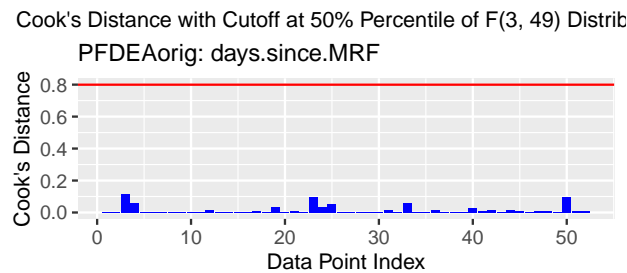
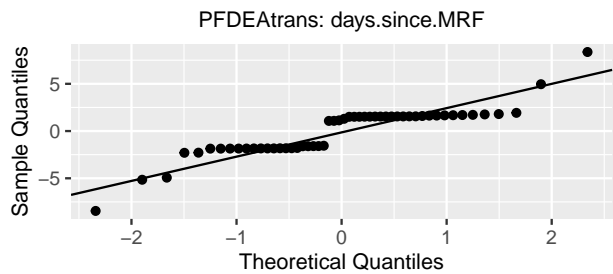
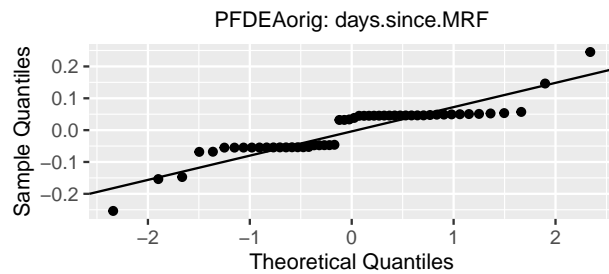
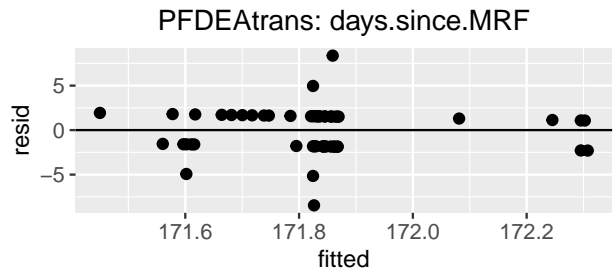
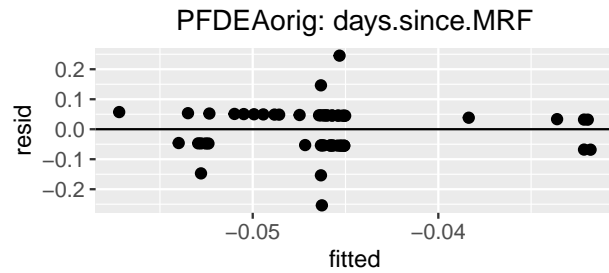
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

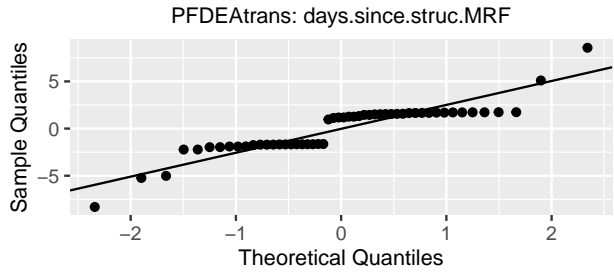
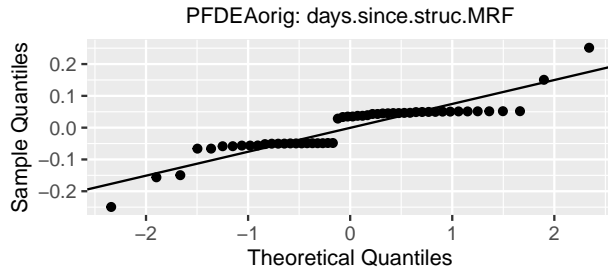
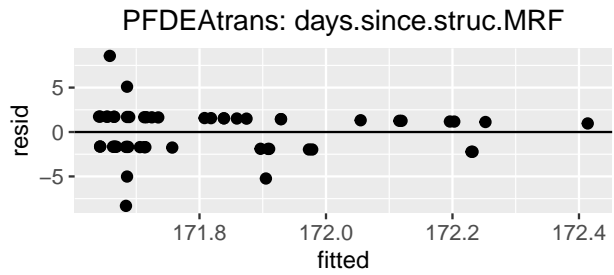
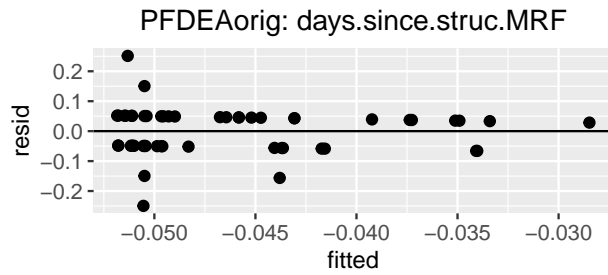


Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib



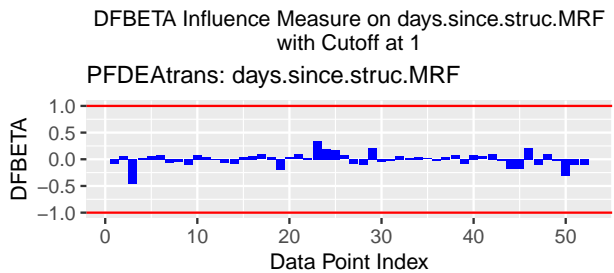
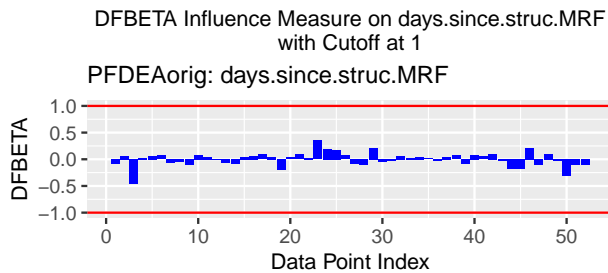
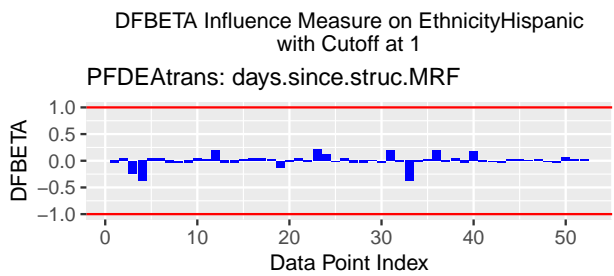
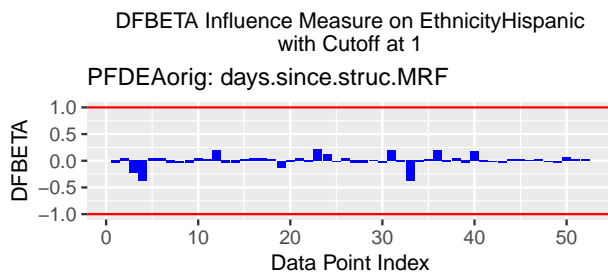
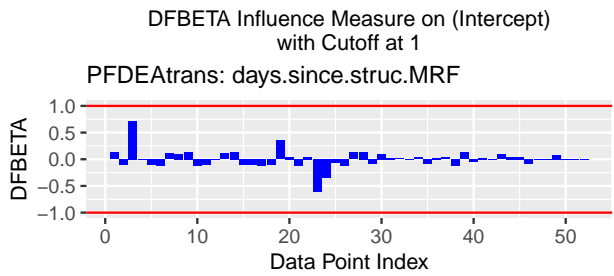
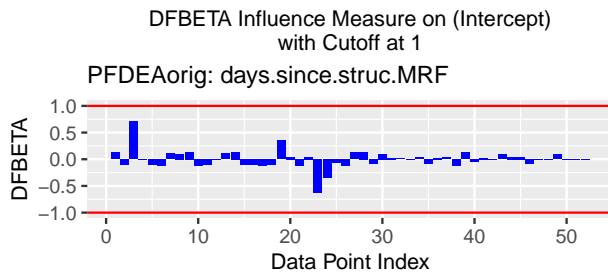
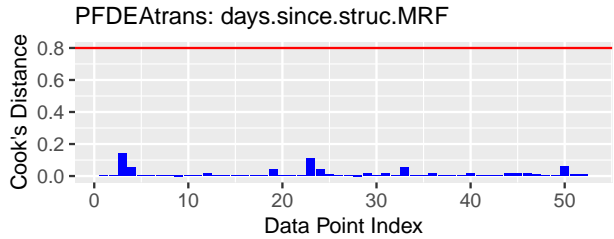
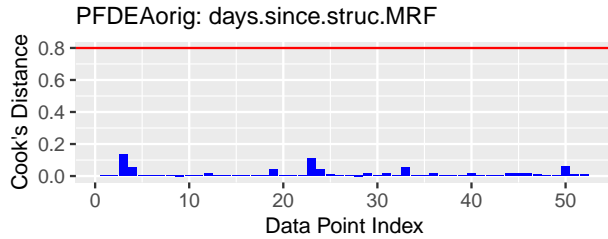


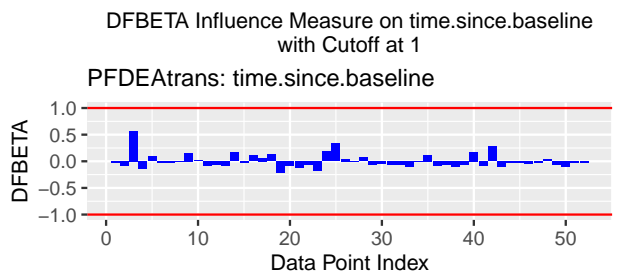
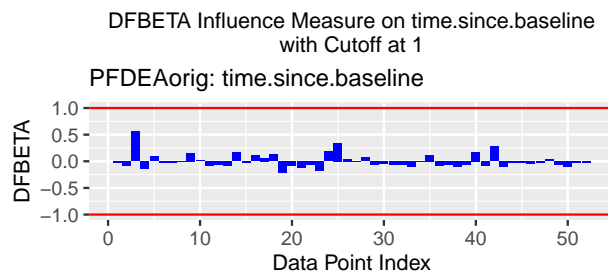
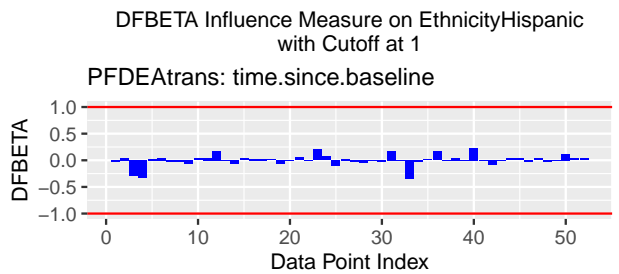
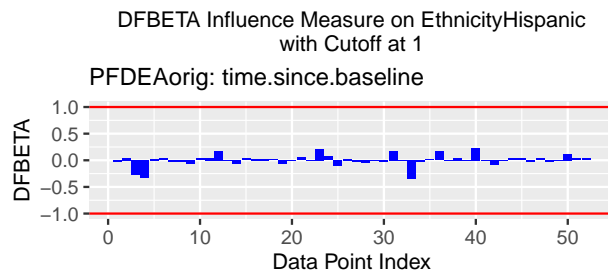
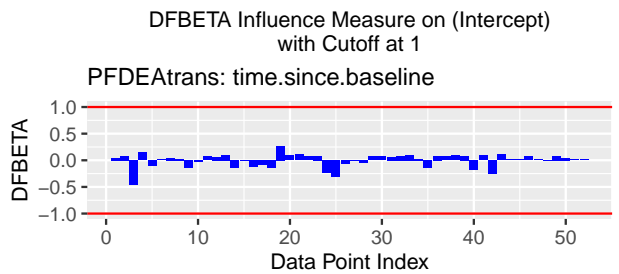
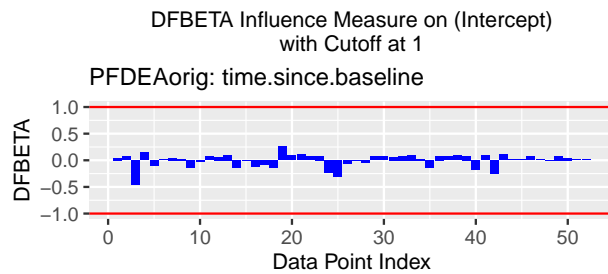
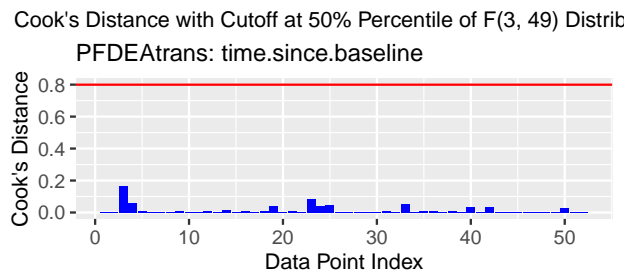
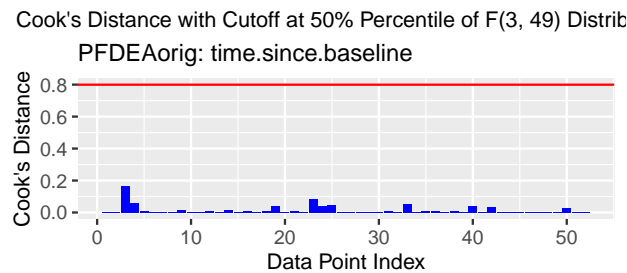
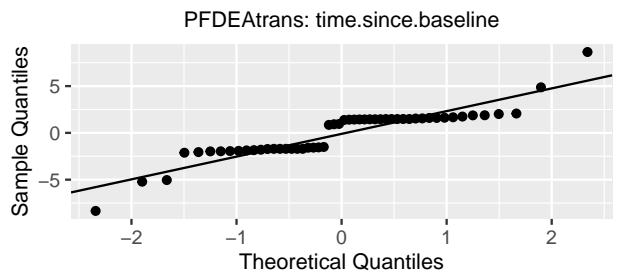
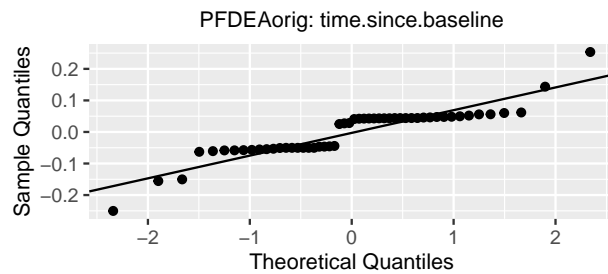
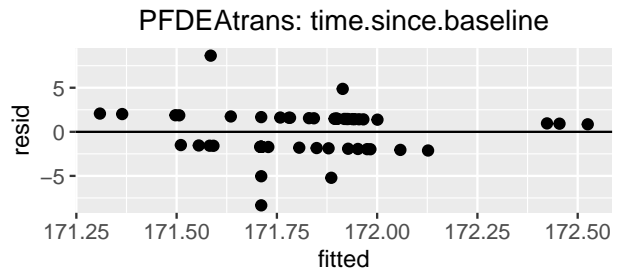
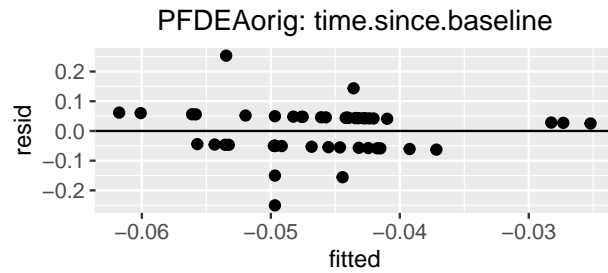


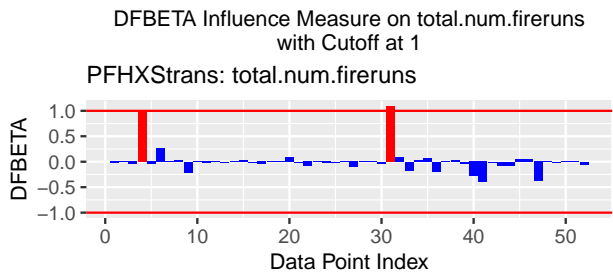
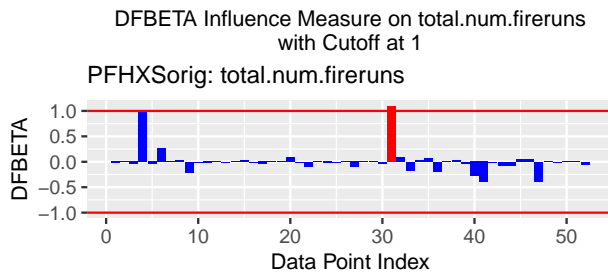
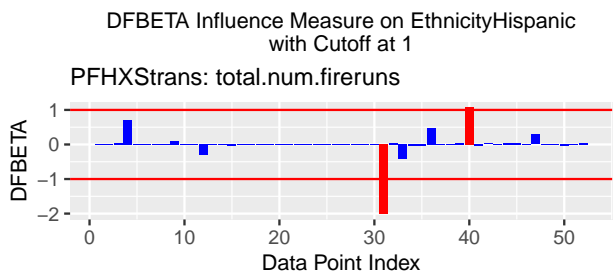
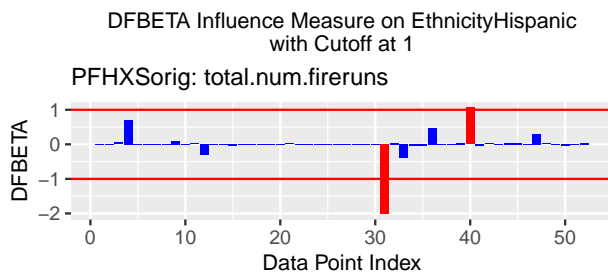
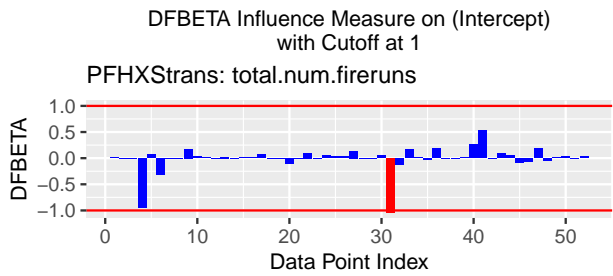
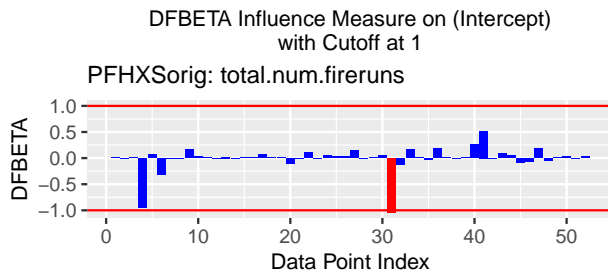
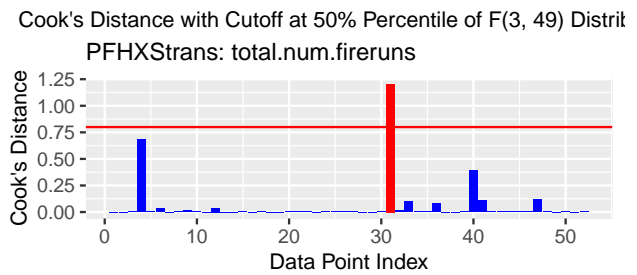
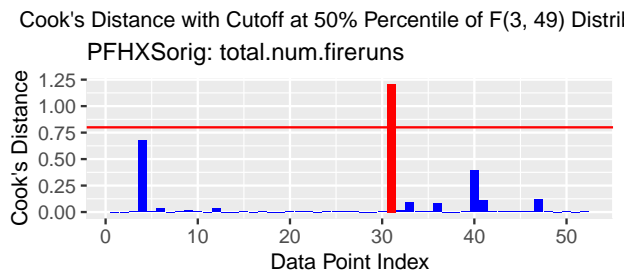
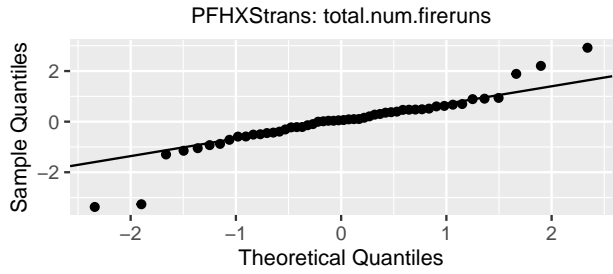
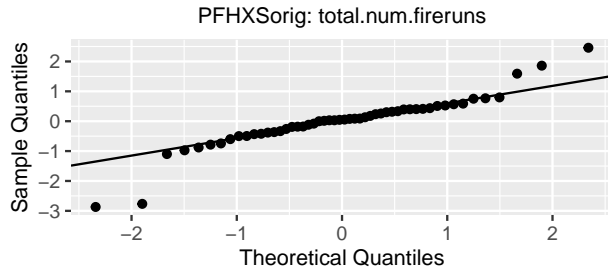
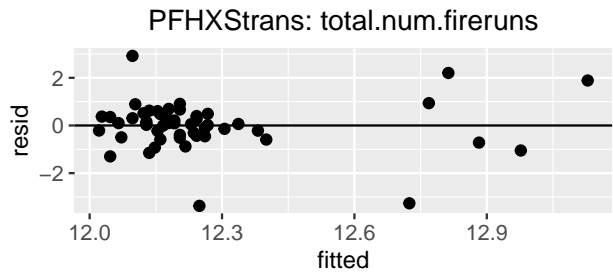
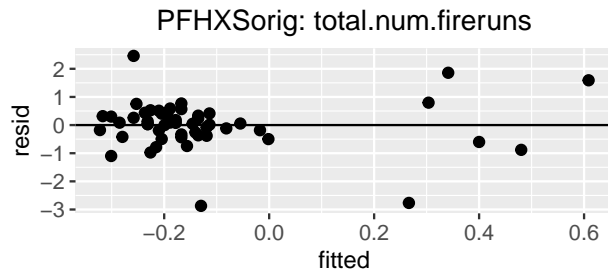


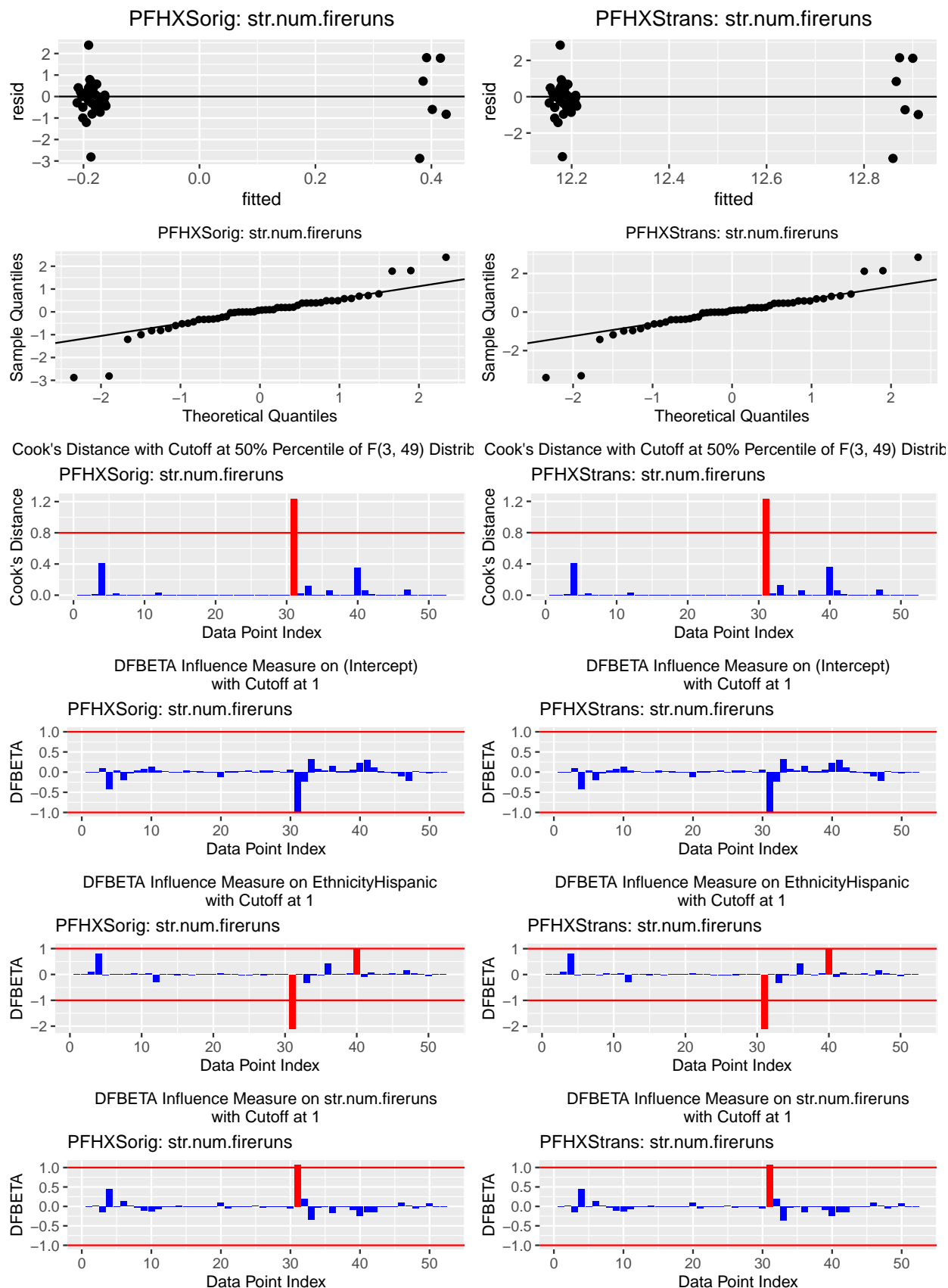
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

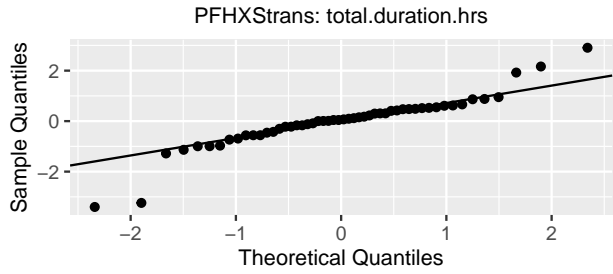
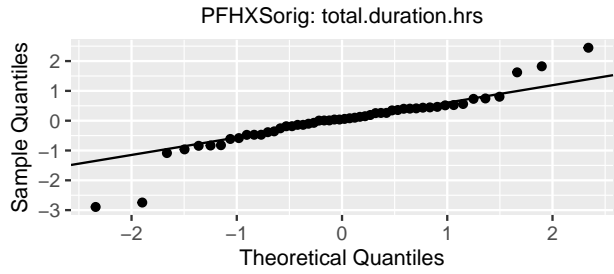
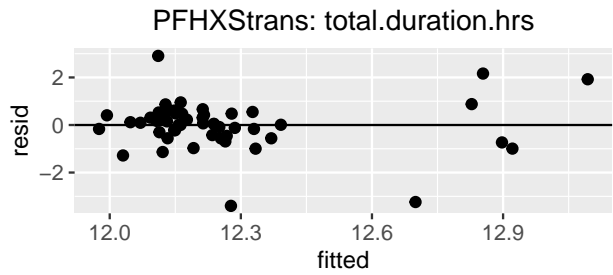
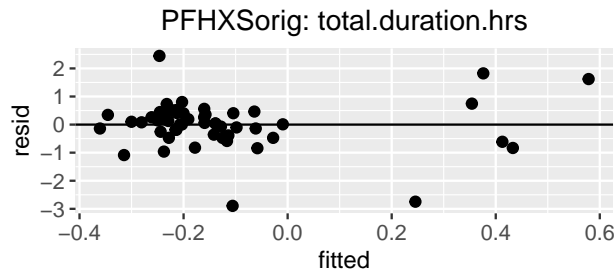
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib





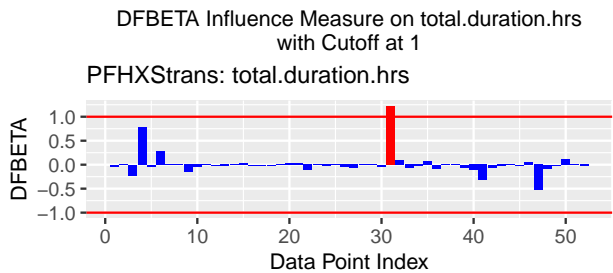
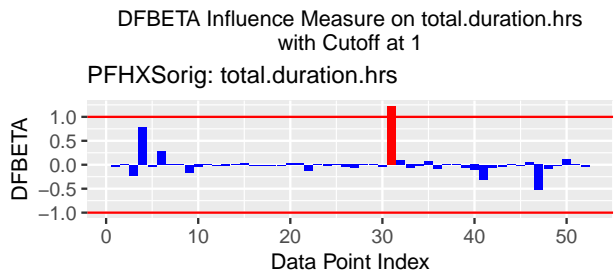
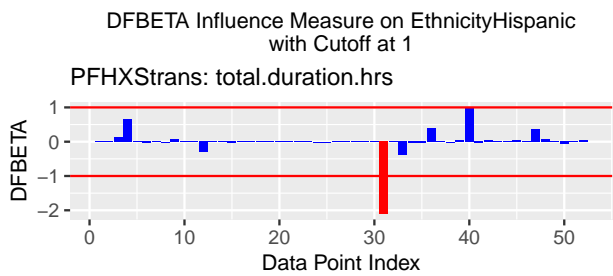
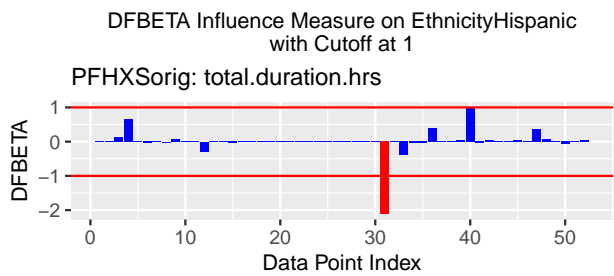
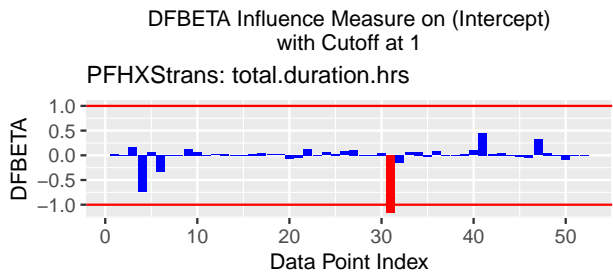
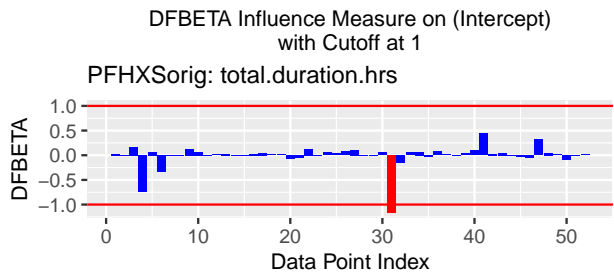
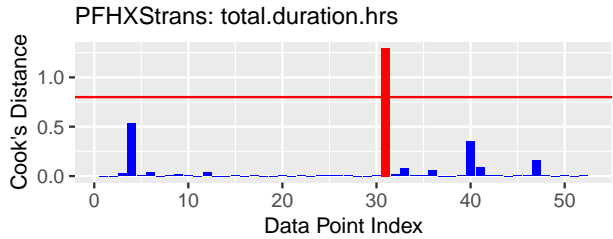
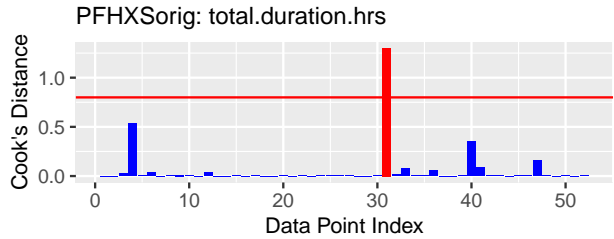


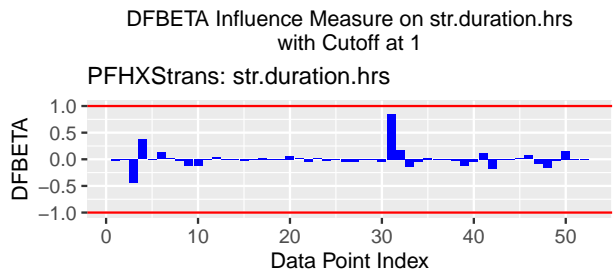
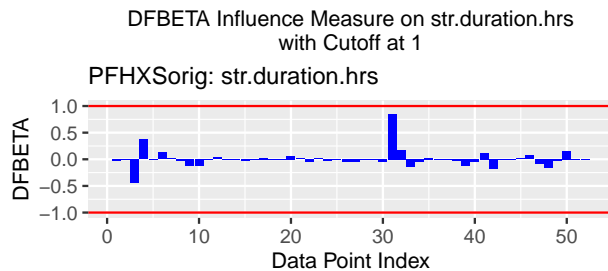
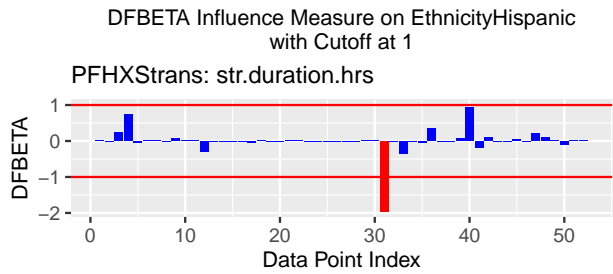
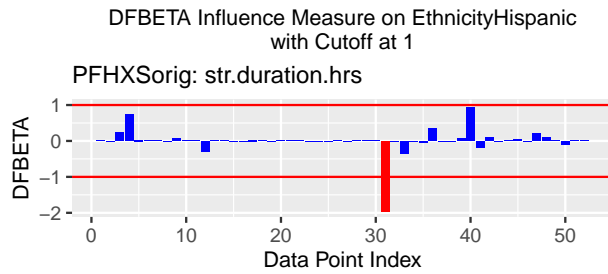
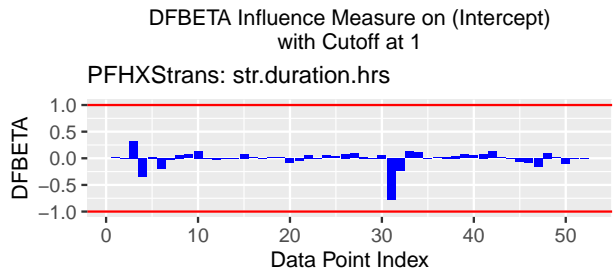
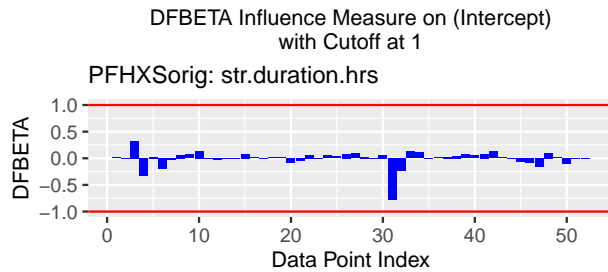
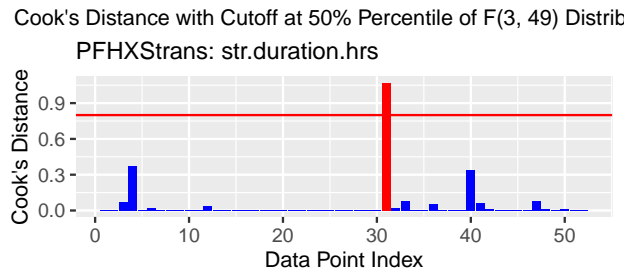
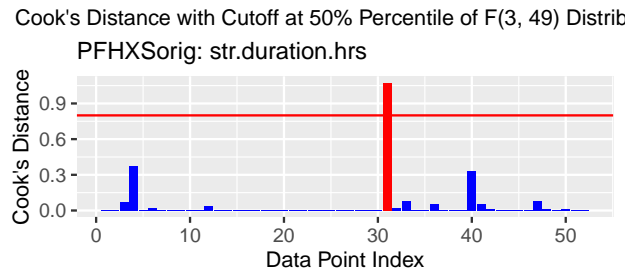
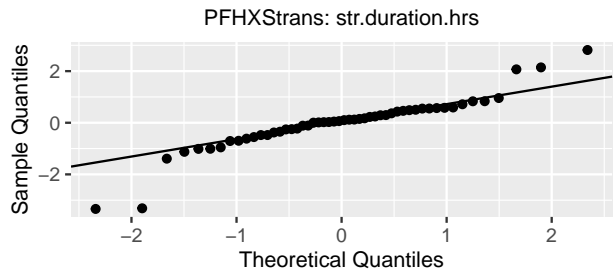
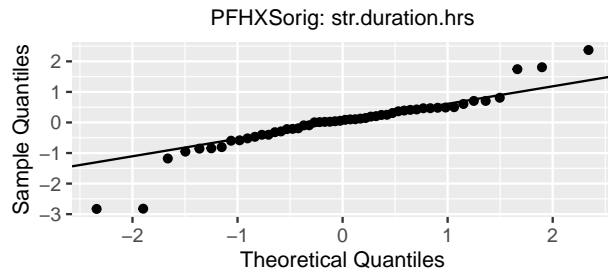
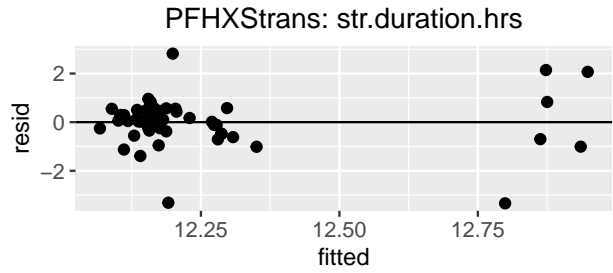
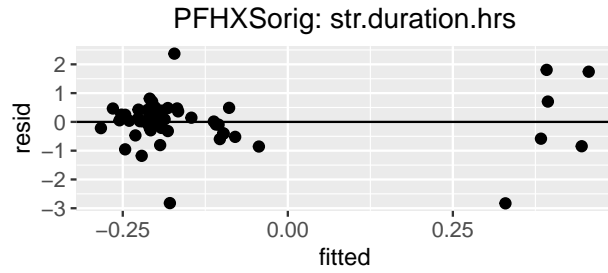


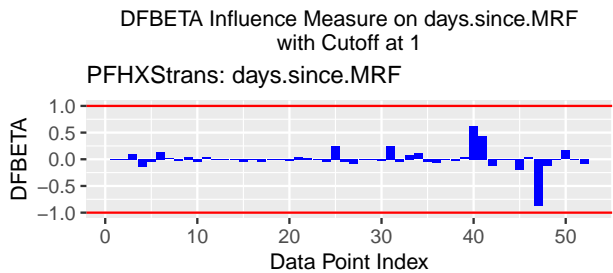
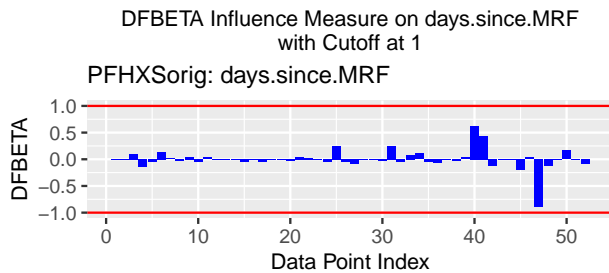
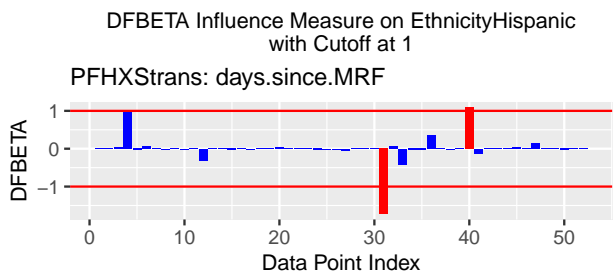
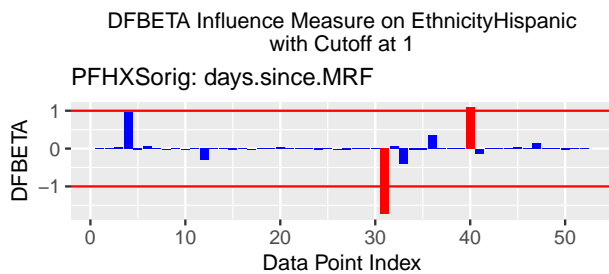
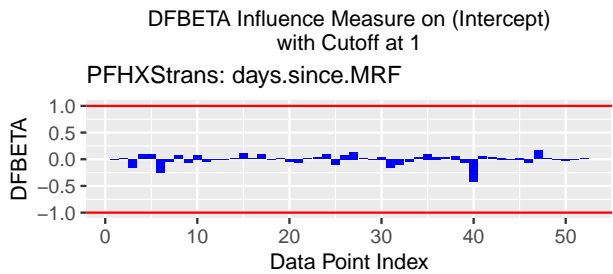
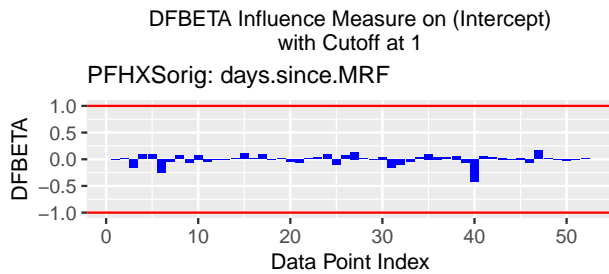
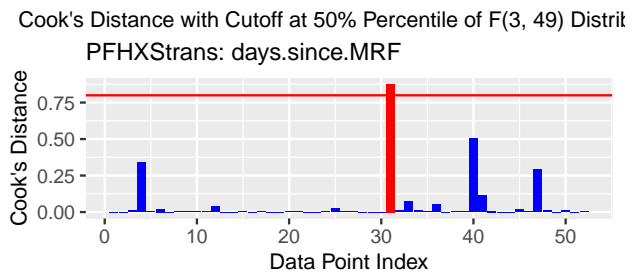
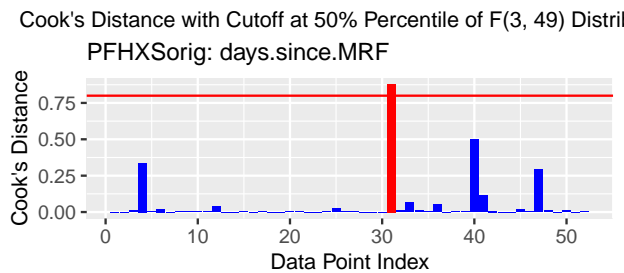
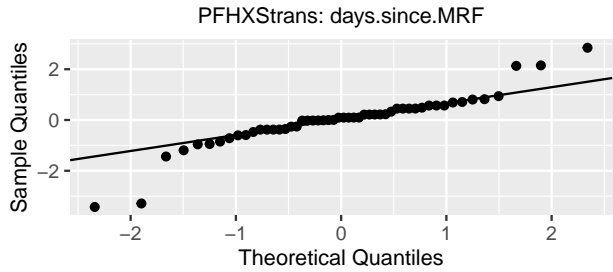
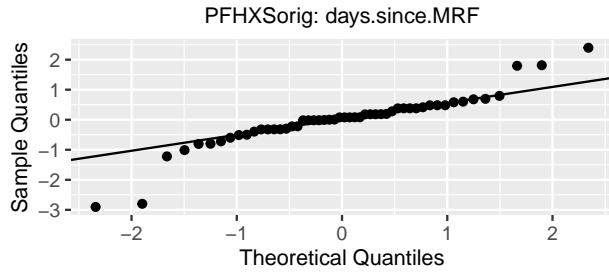
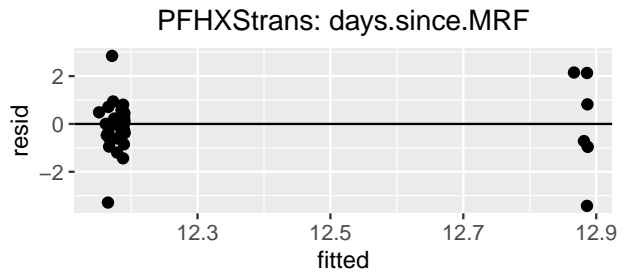
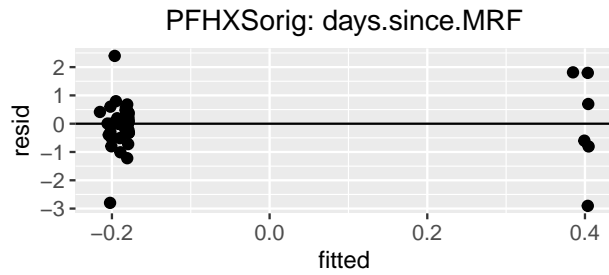


Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

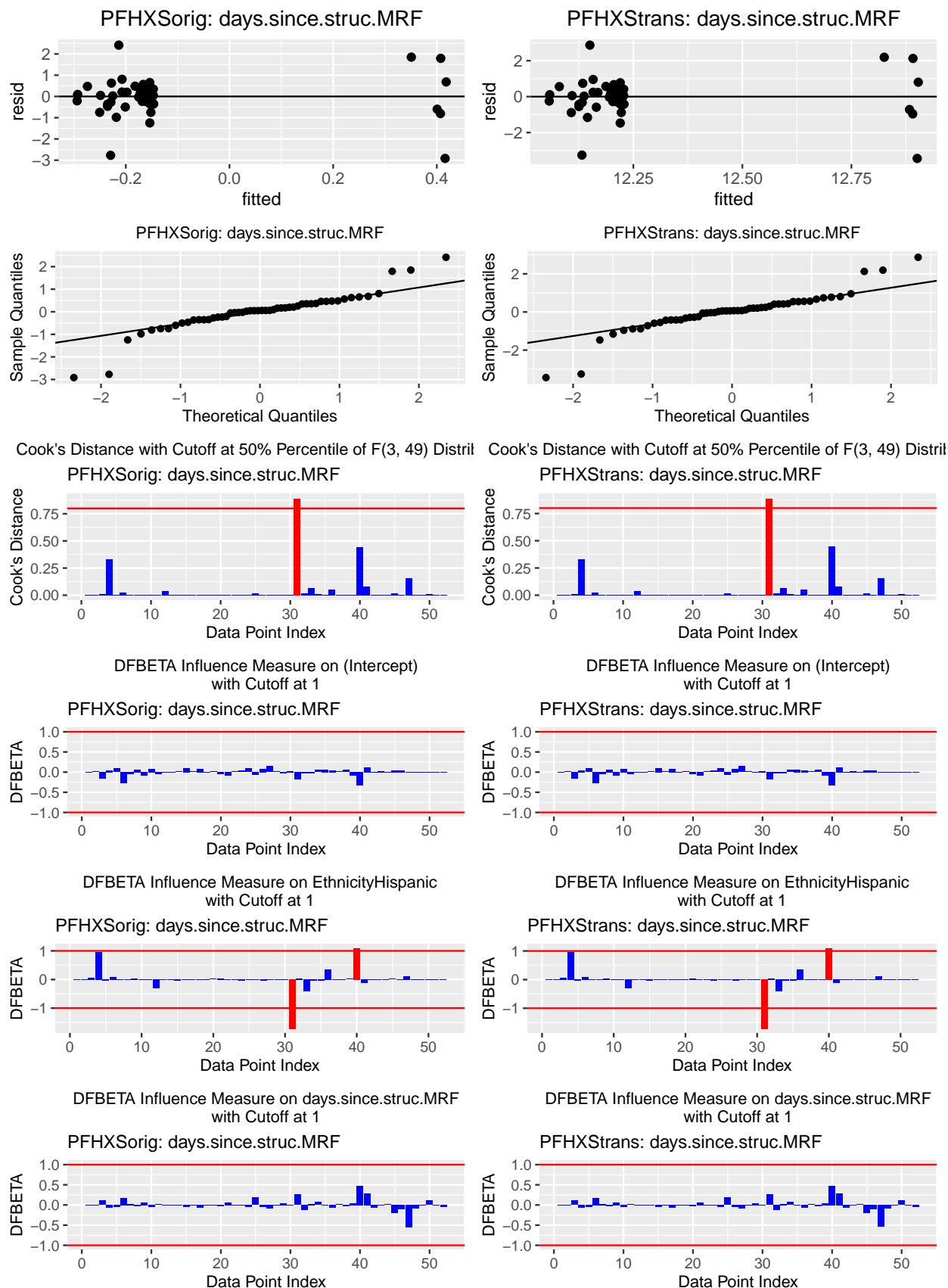
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

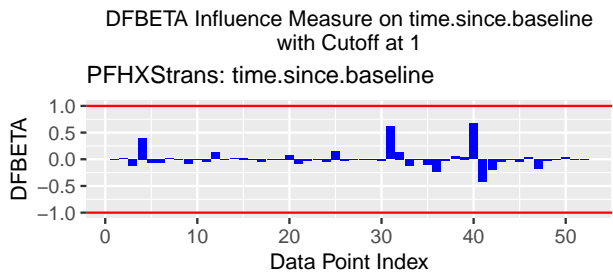
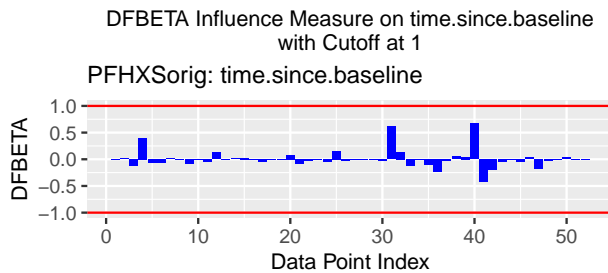
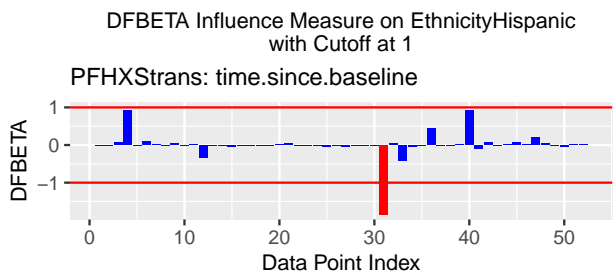
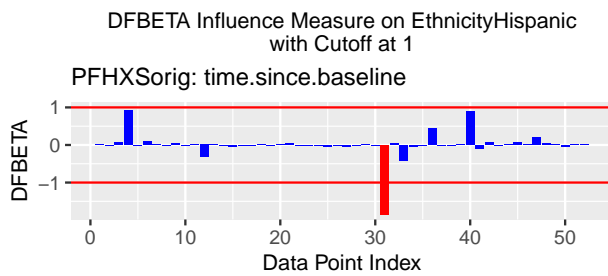
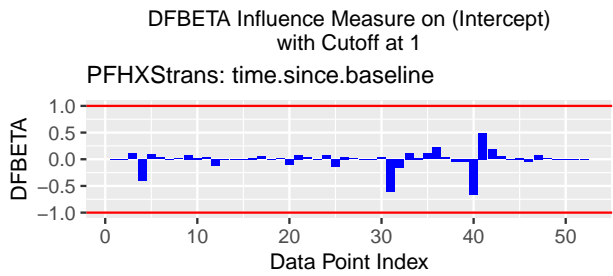
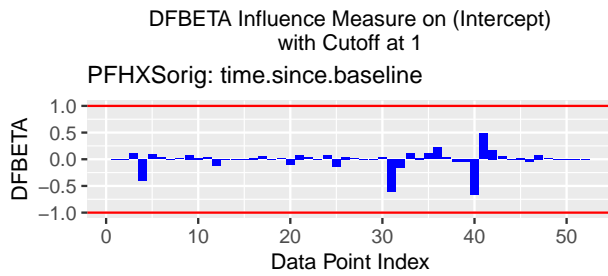
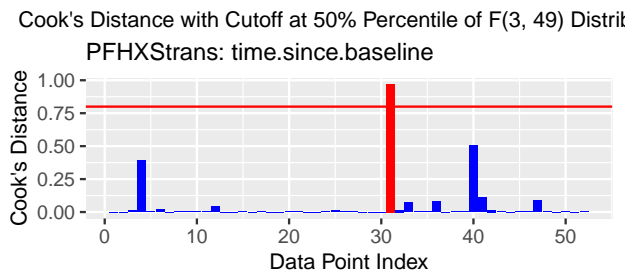
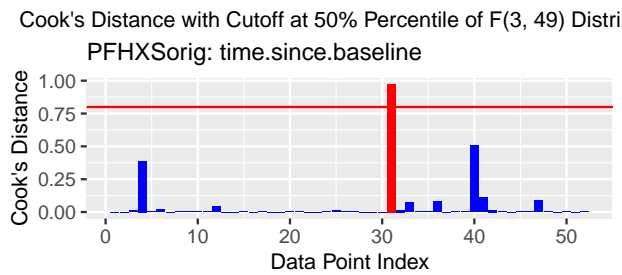
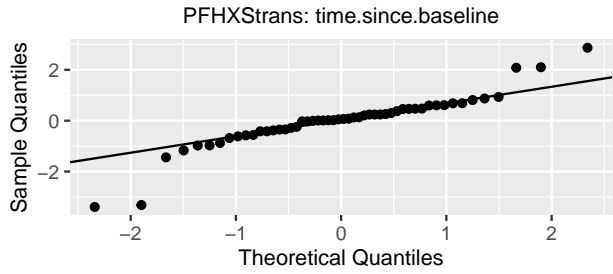
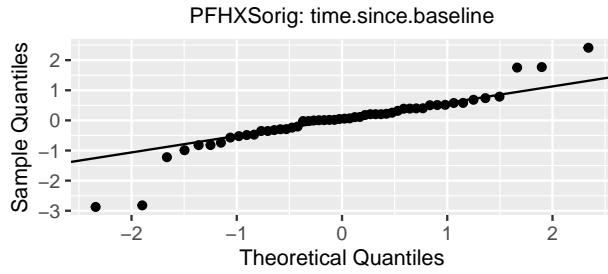
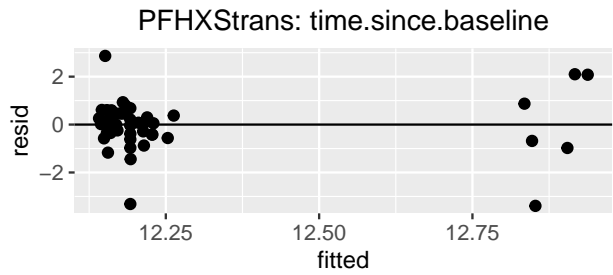
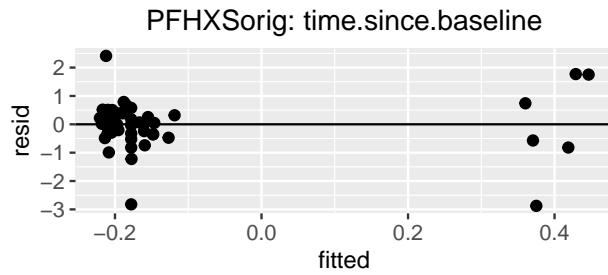


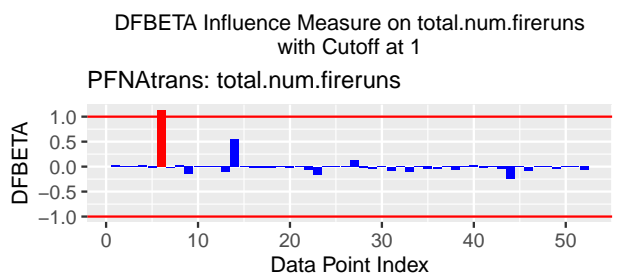
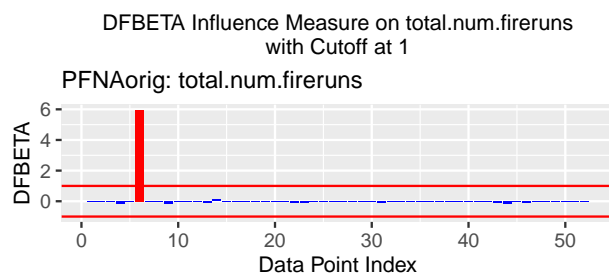
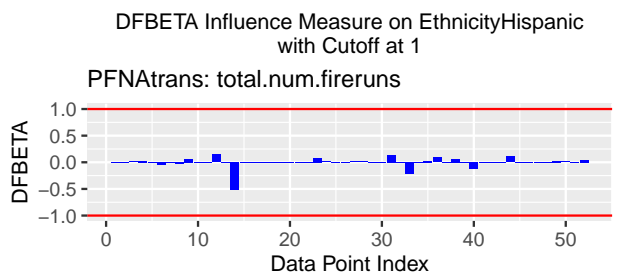
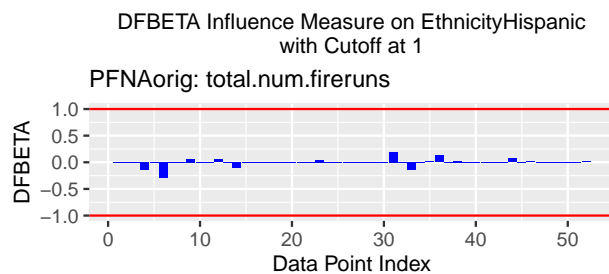
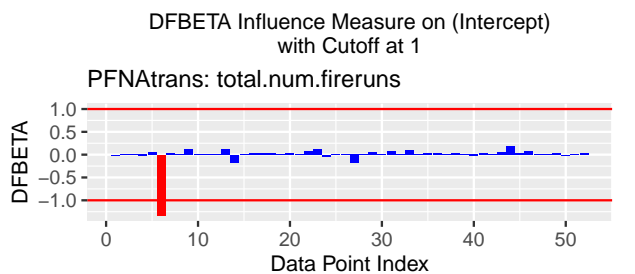
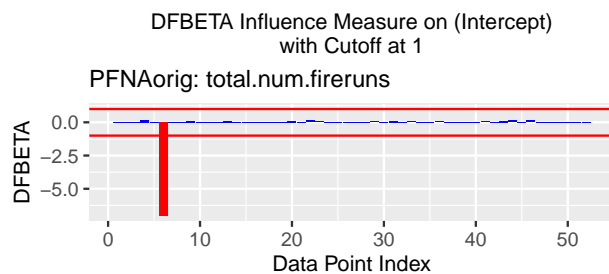
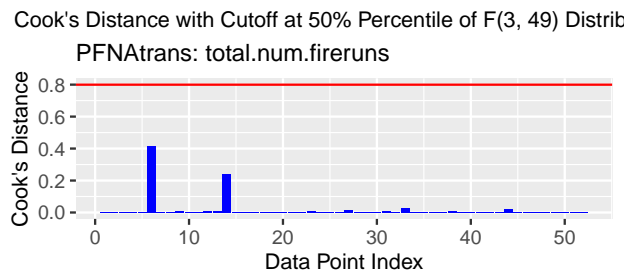
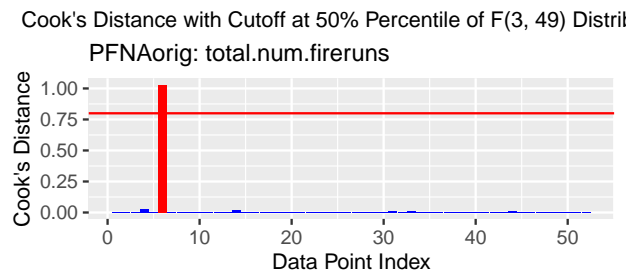
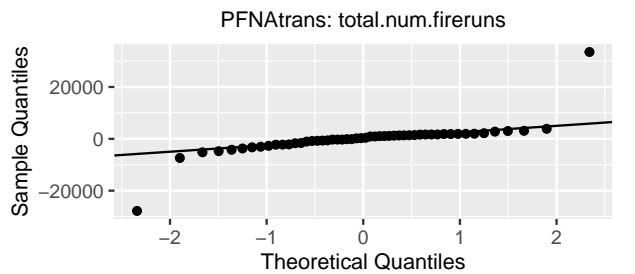
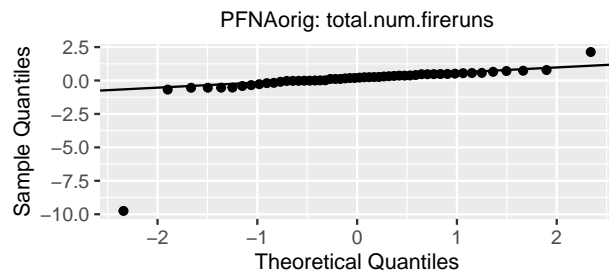
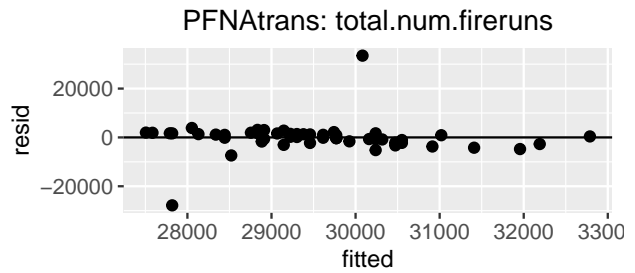
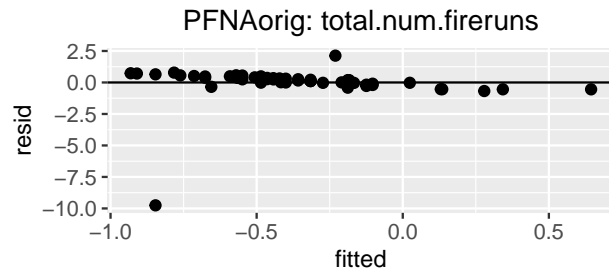


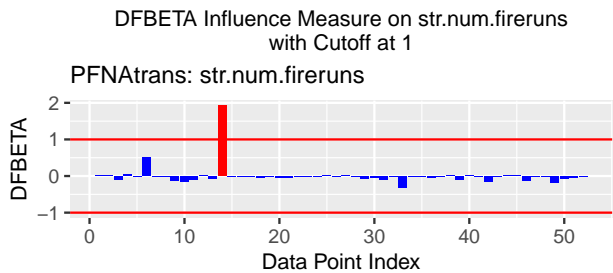
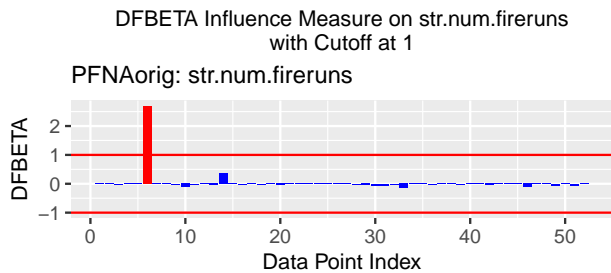
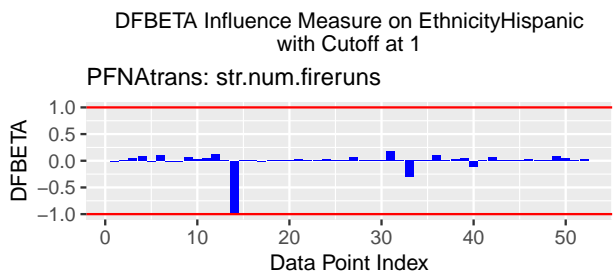
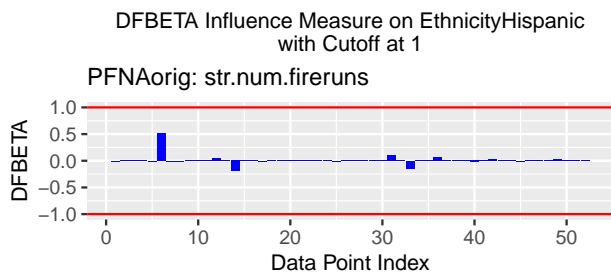
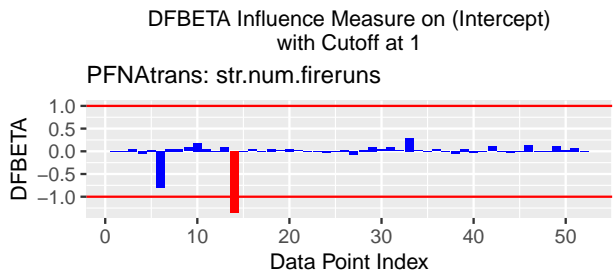
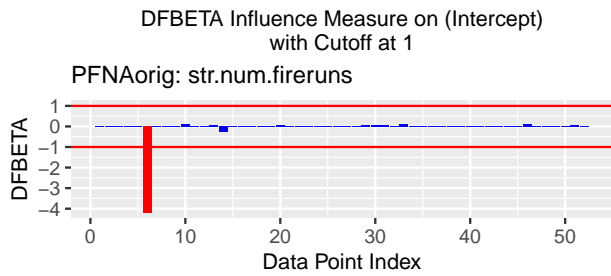
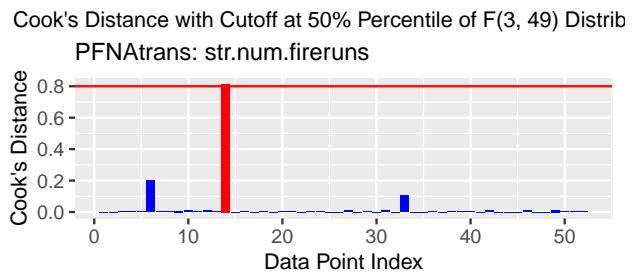
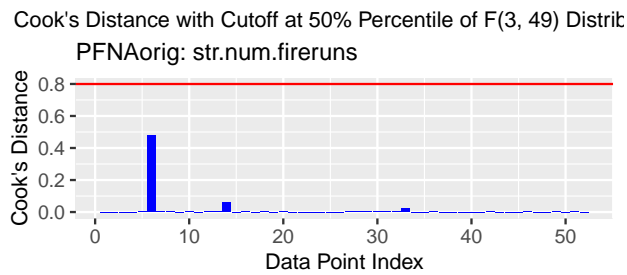
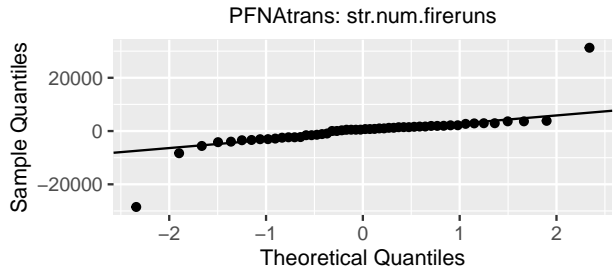
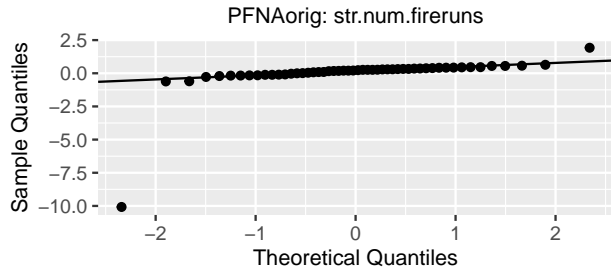
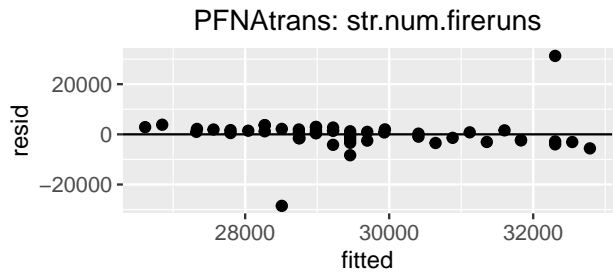
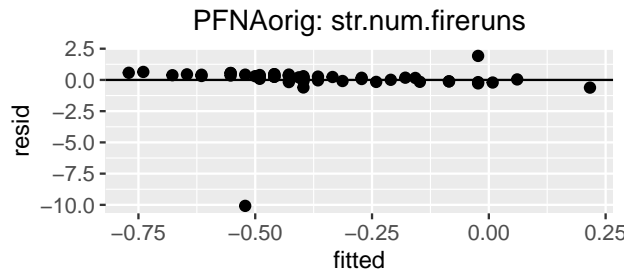


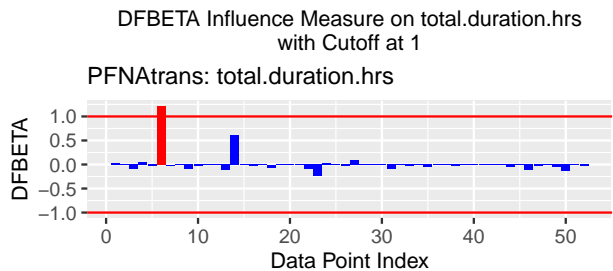
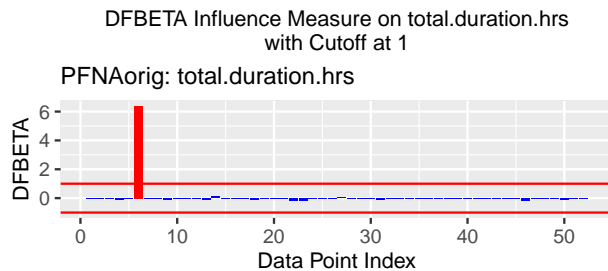
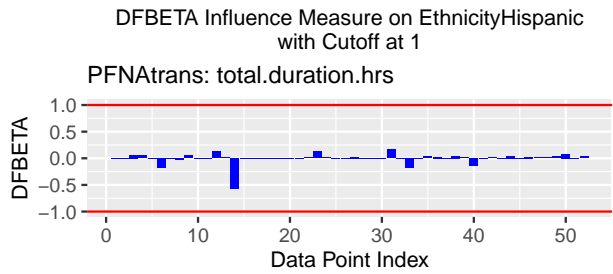
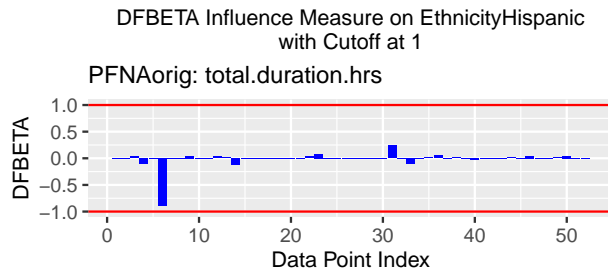
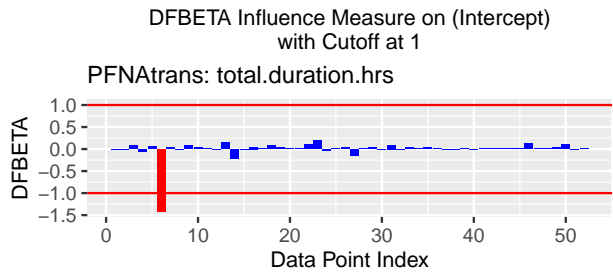
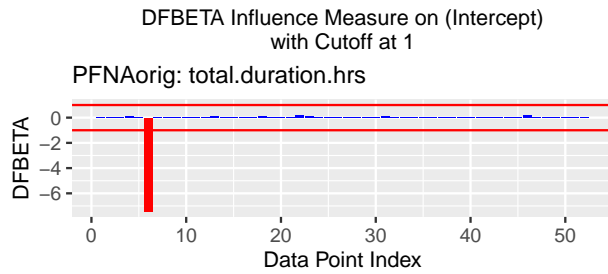
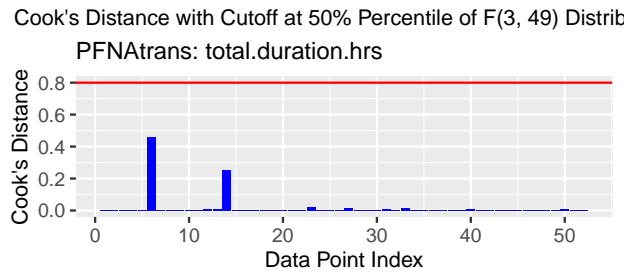
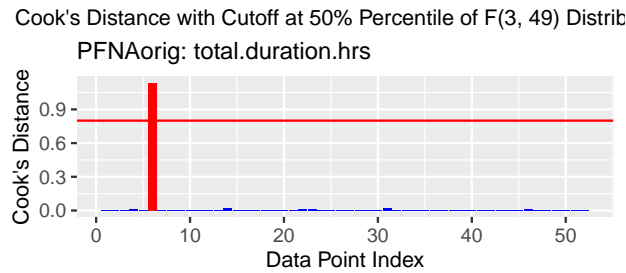
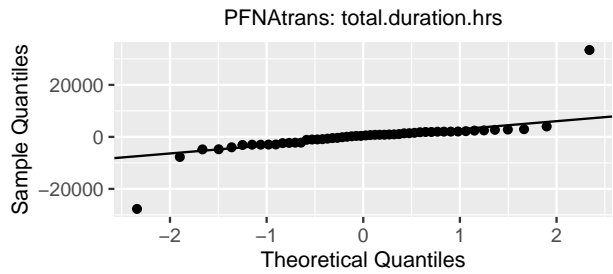
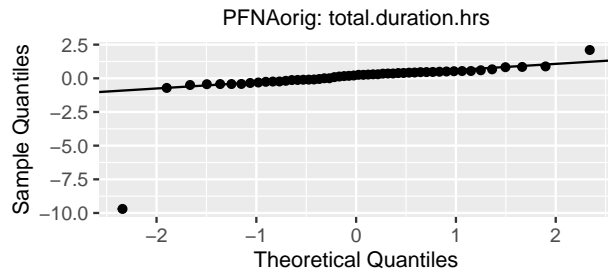
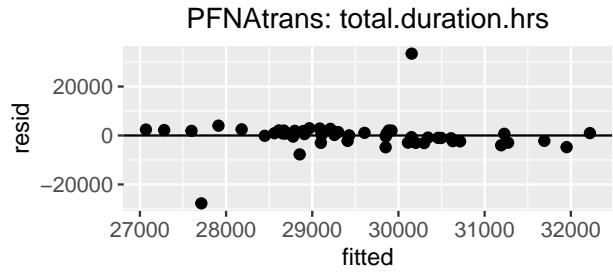
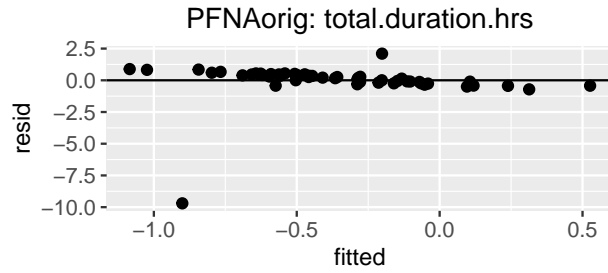


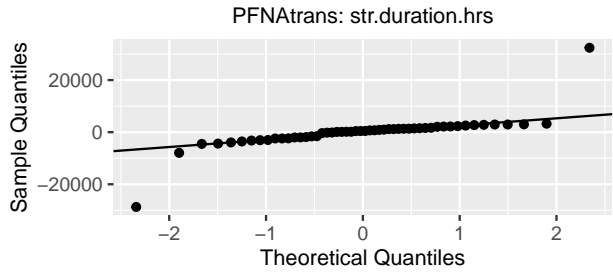
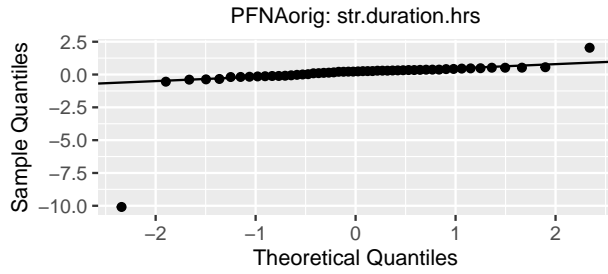
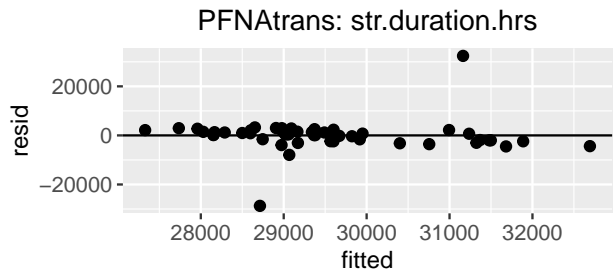
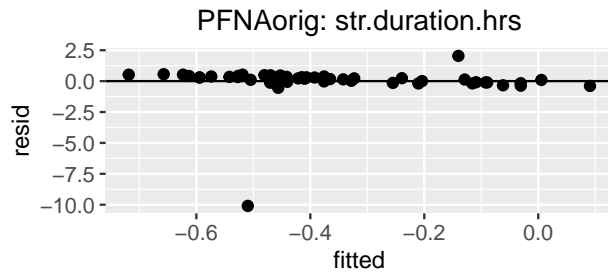






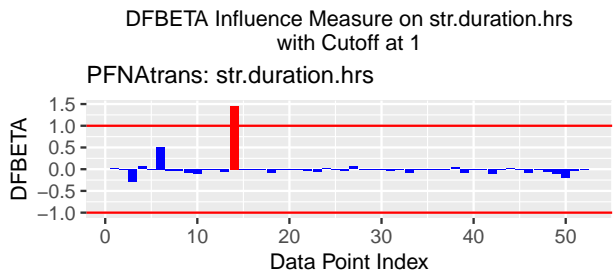
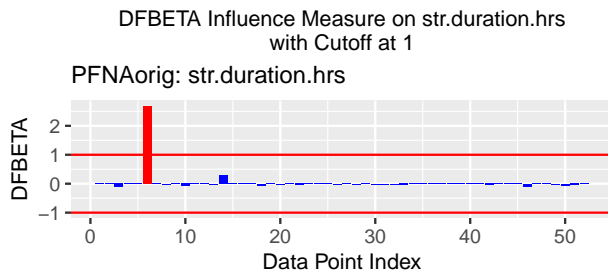
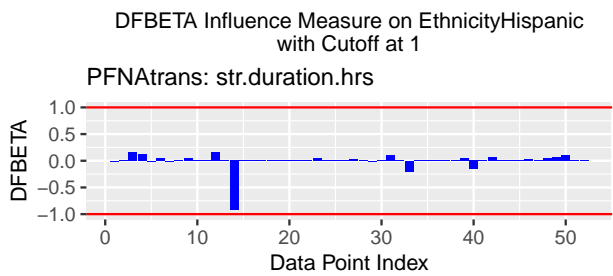
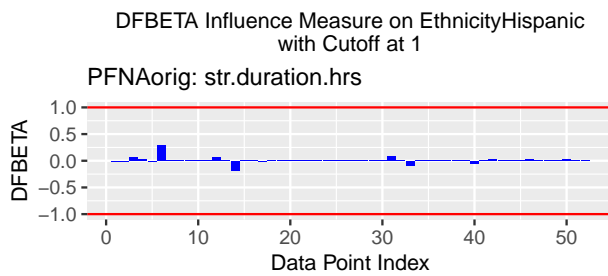
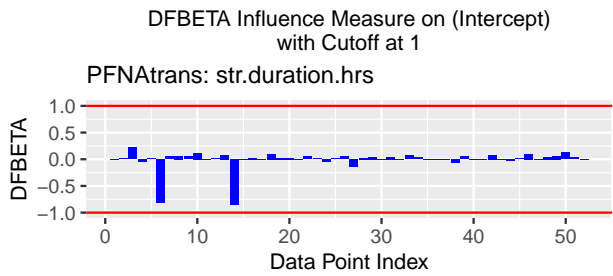
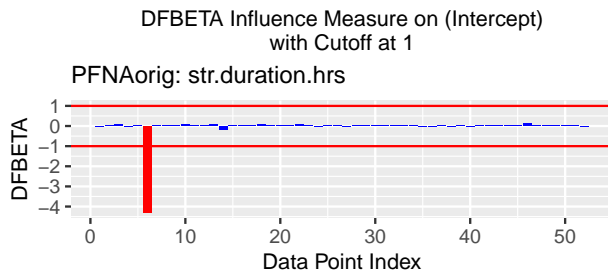
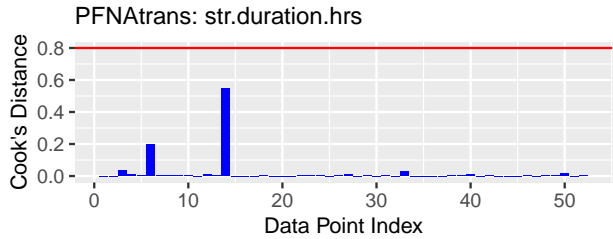
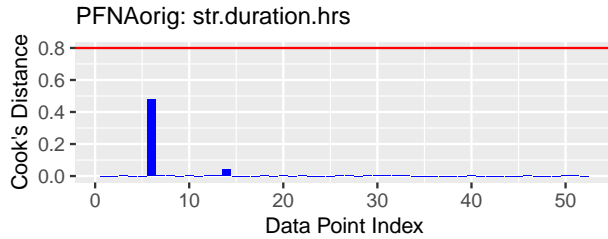


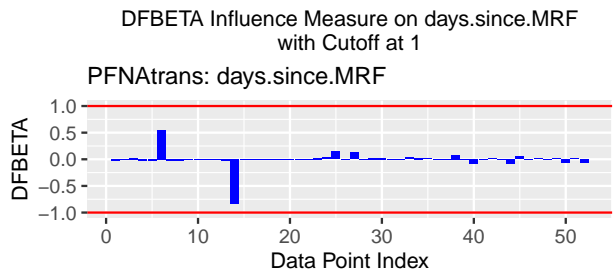
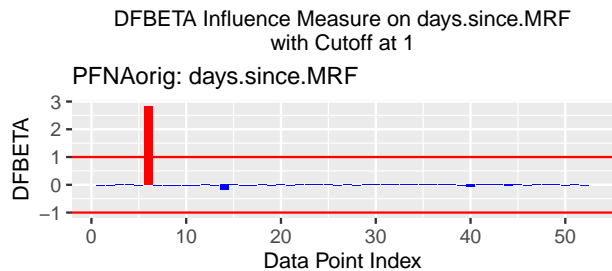
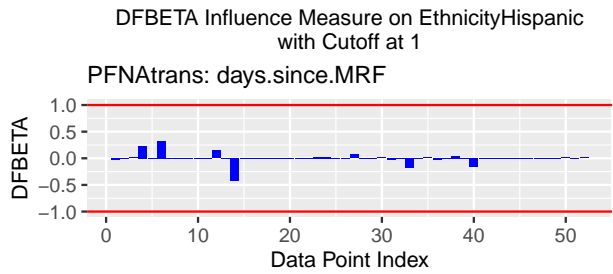
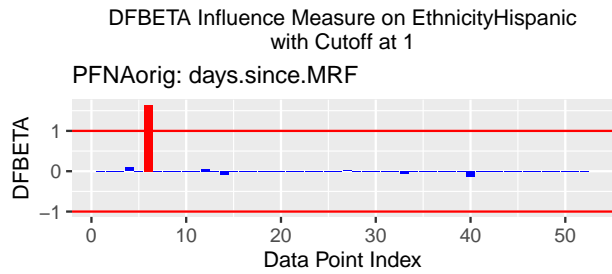
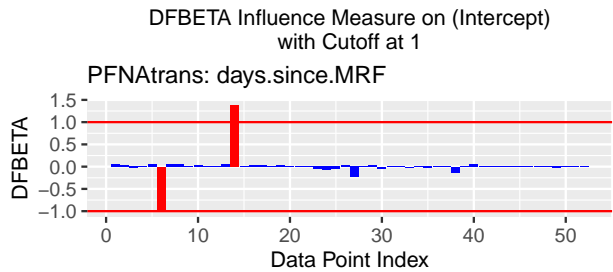
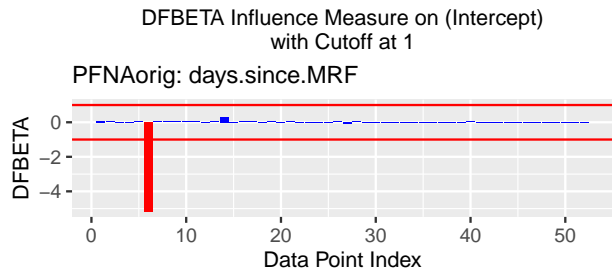
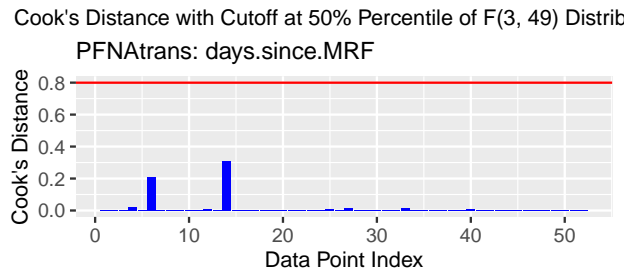
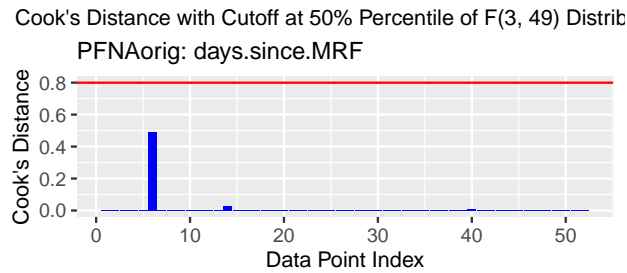
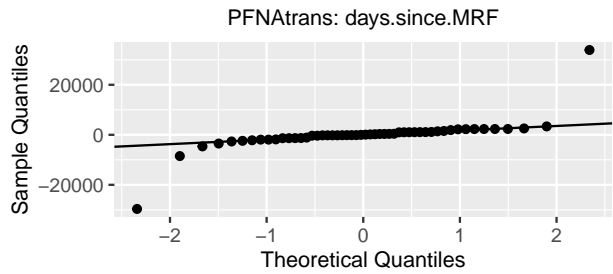
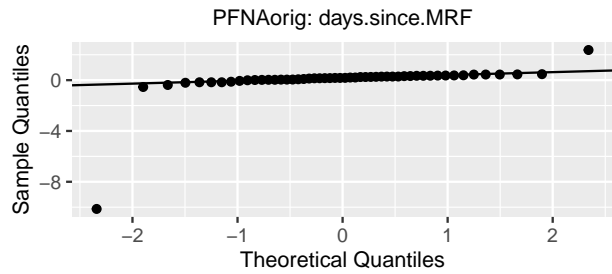
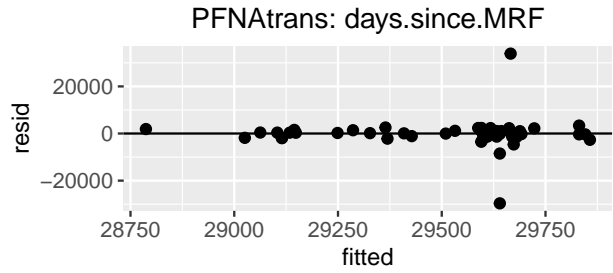
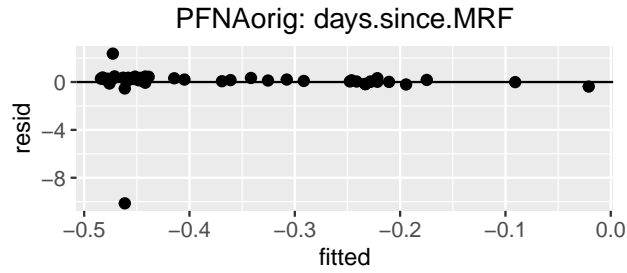


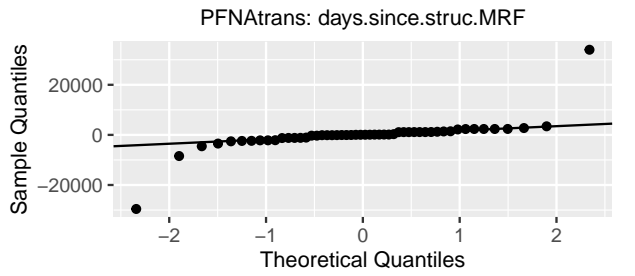
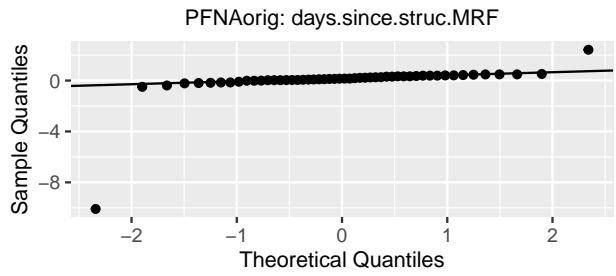
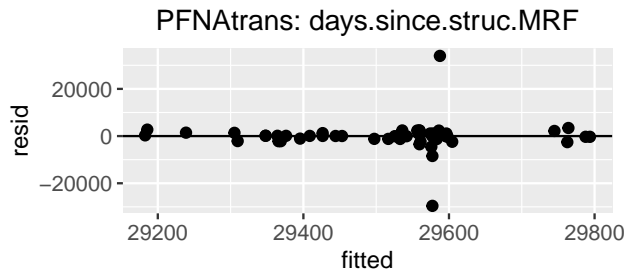
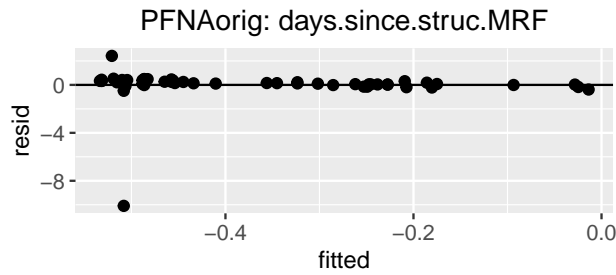


Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

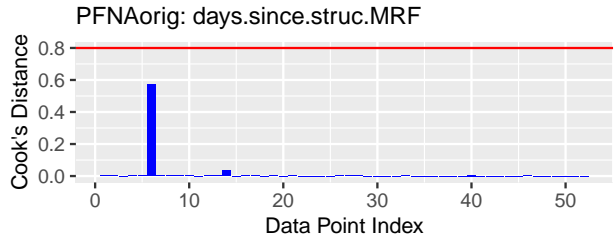
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib



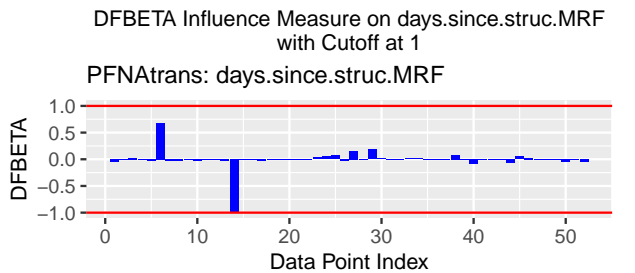
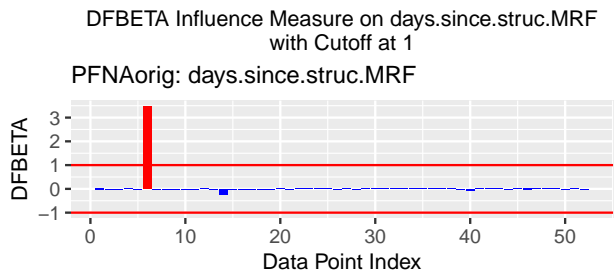
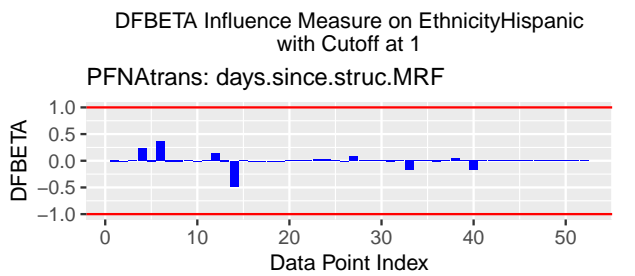
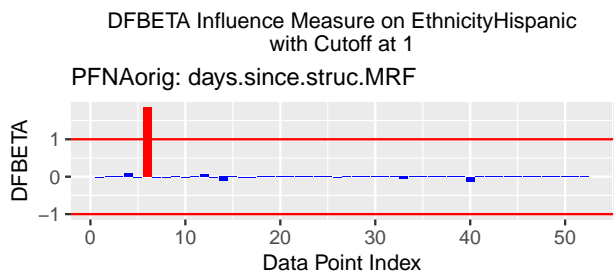
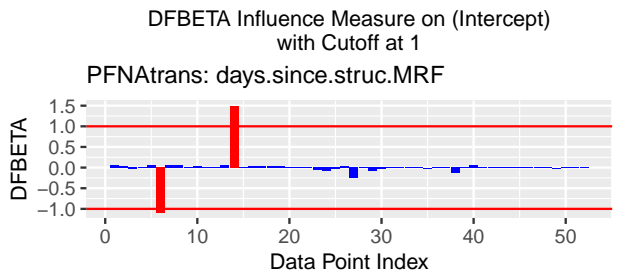
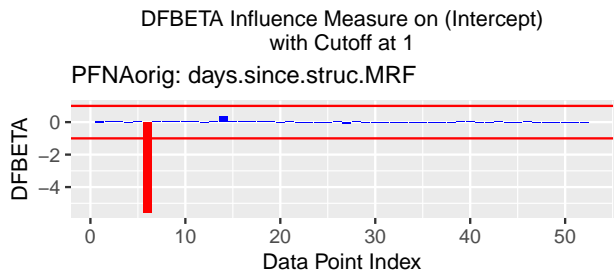
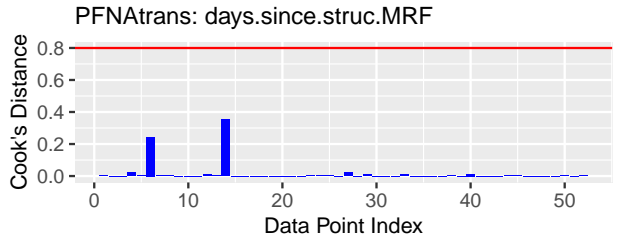




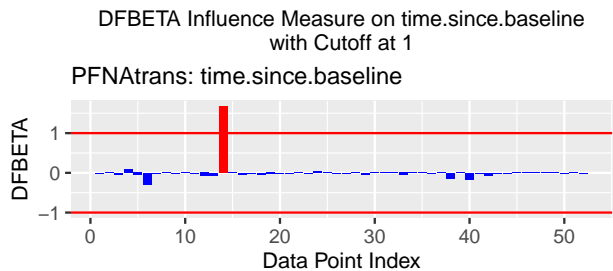
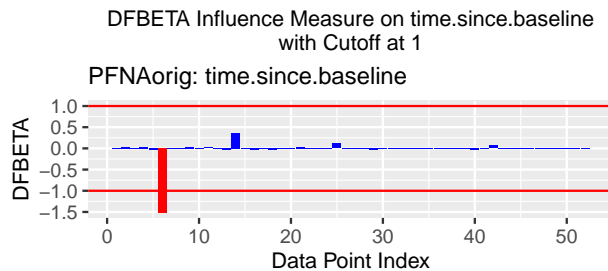
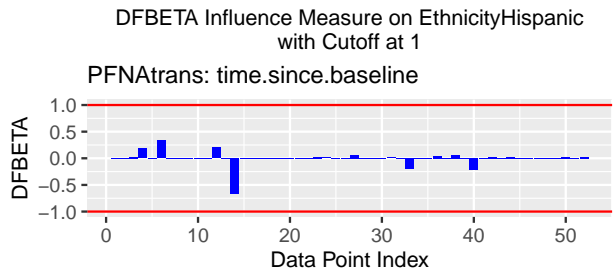
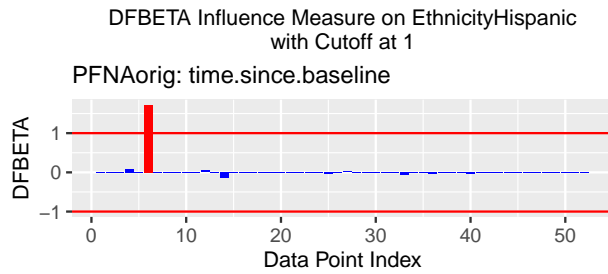
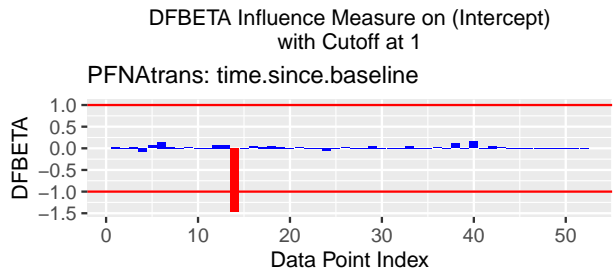
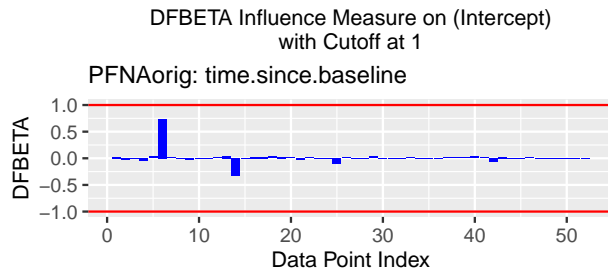
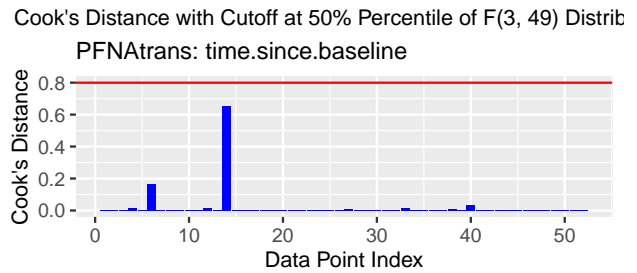
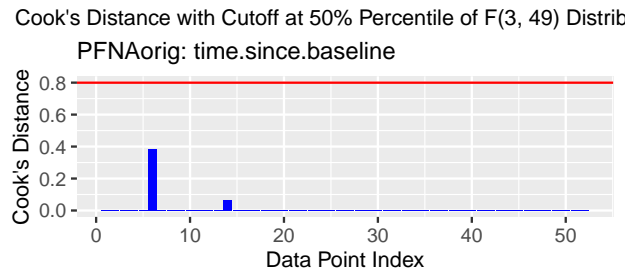
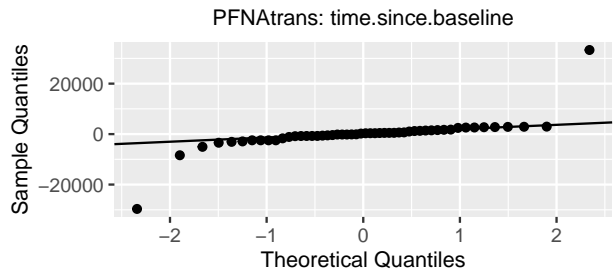
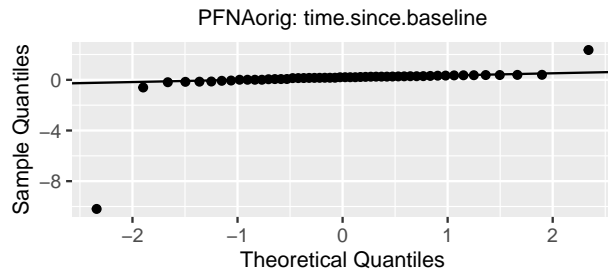
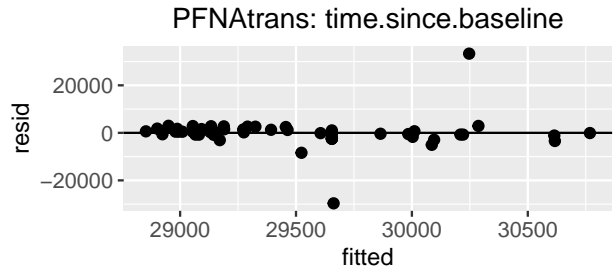
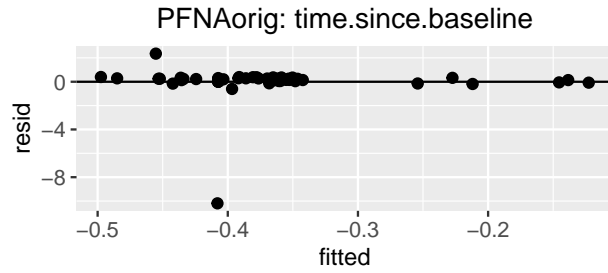
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

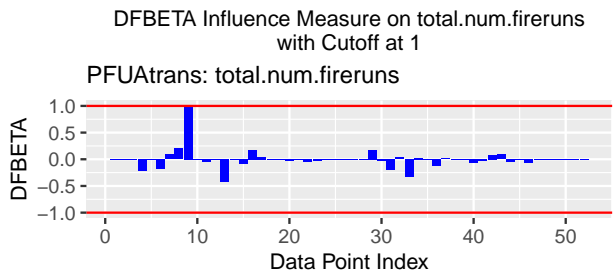
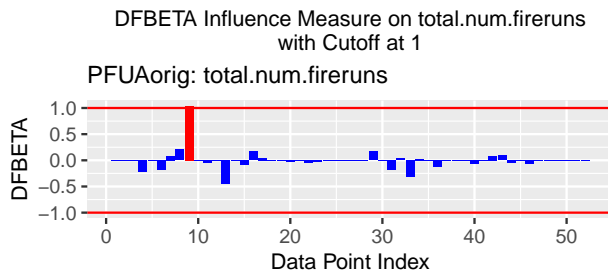
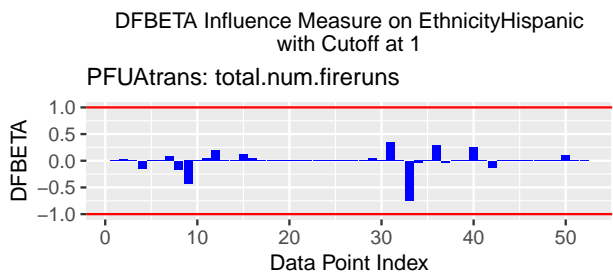
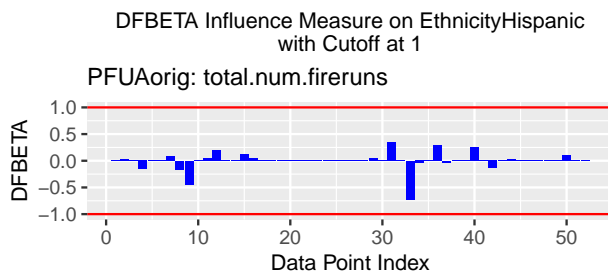
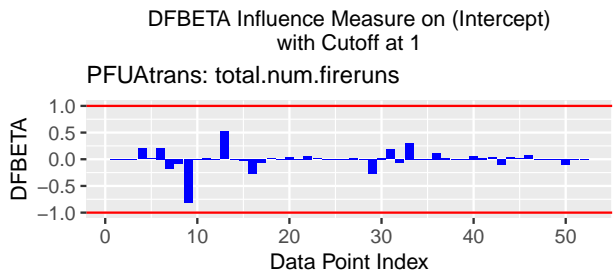
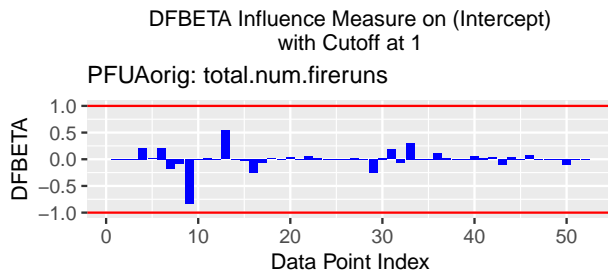
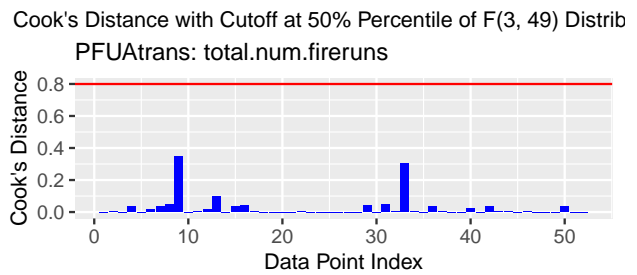
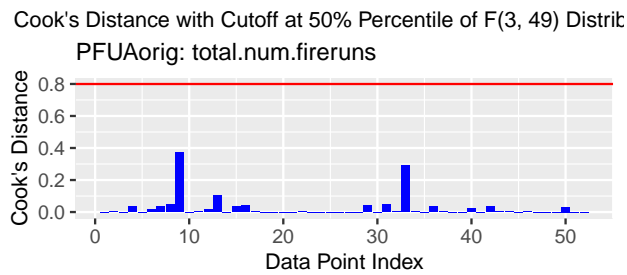
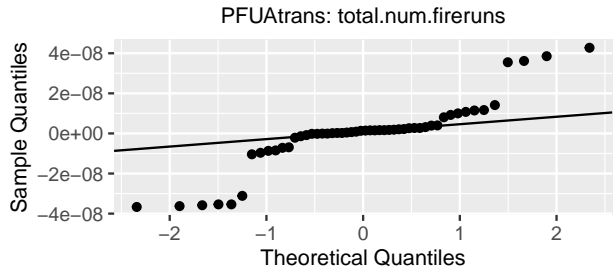
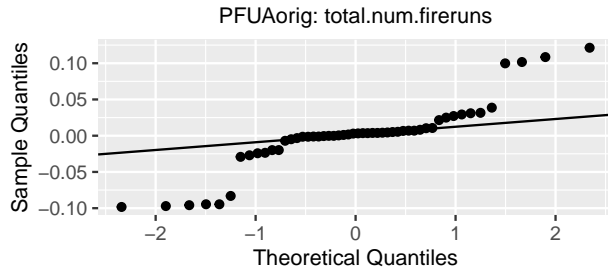
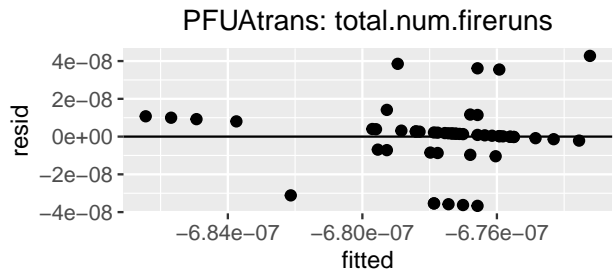
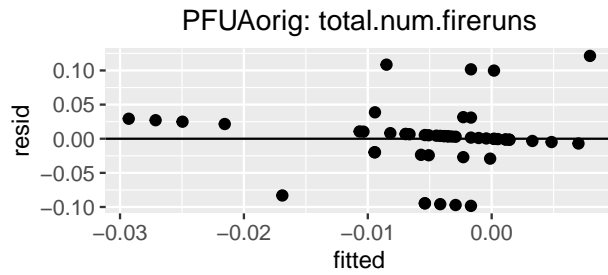


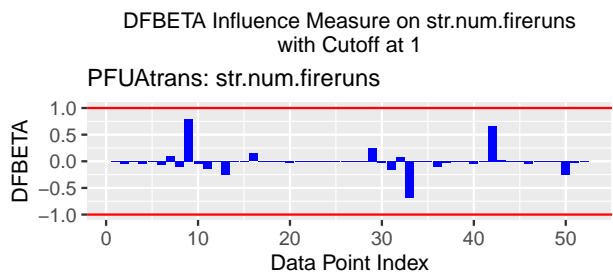
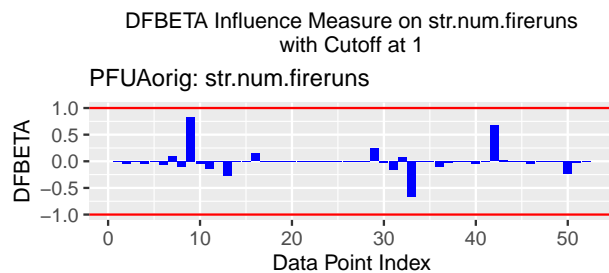
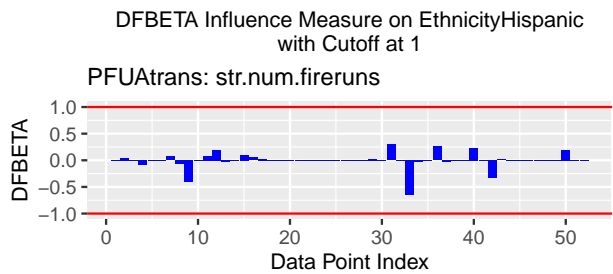
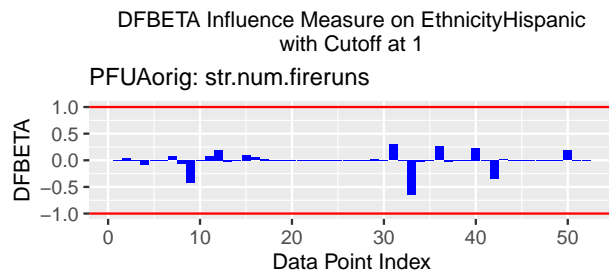
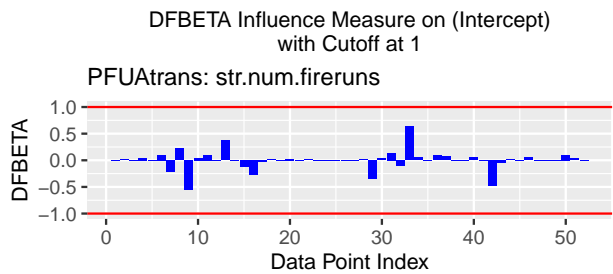
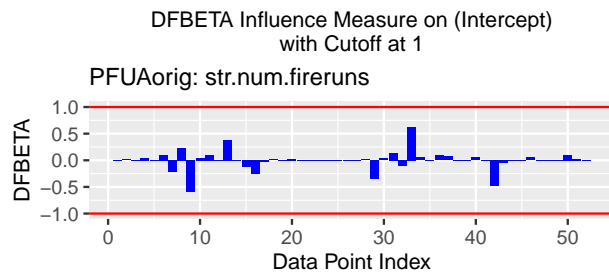
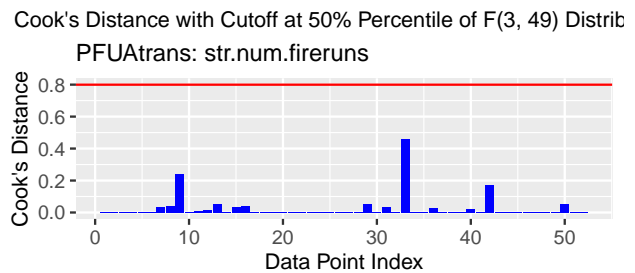
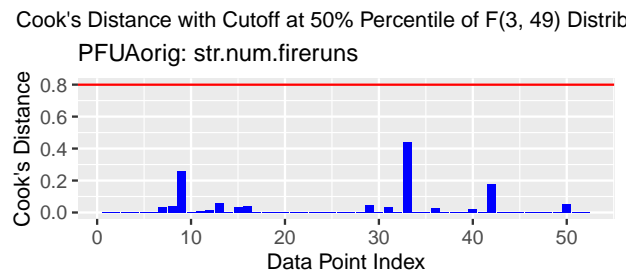
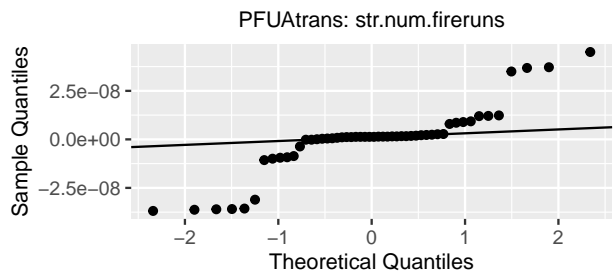
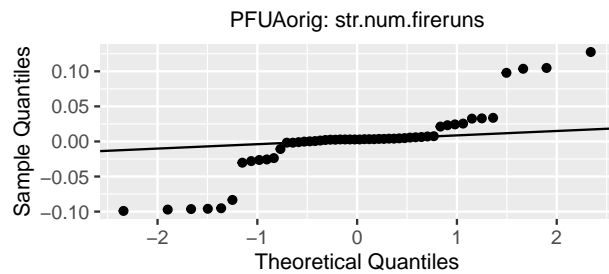
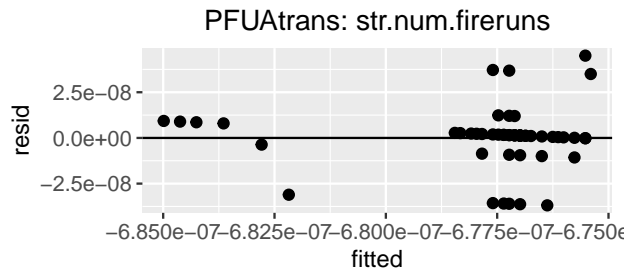
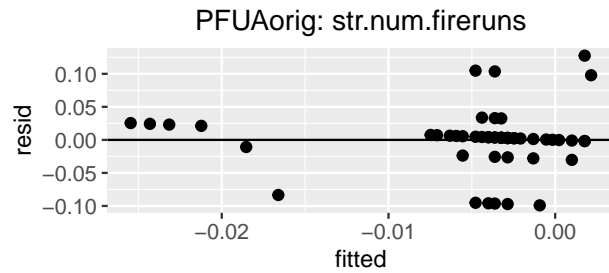
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

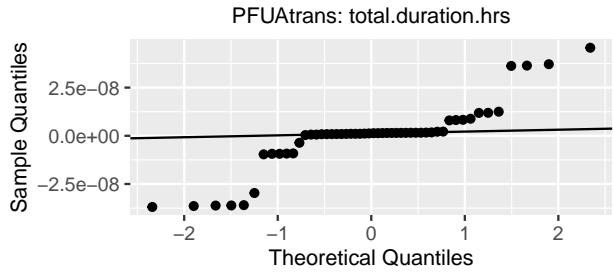
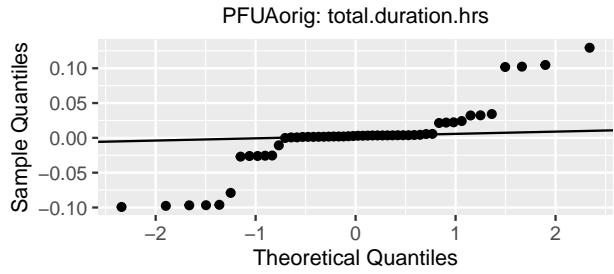
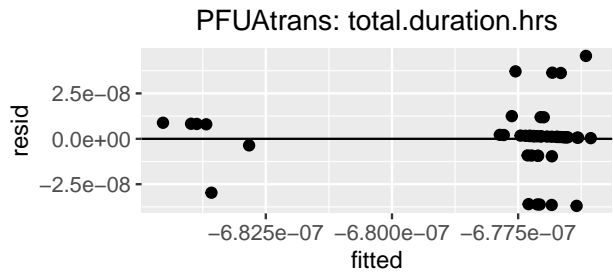
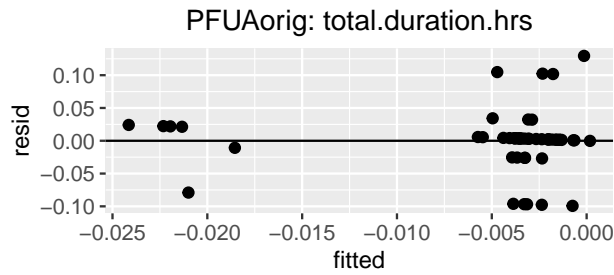






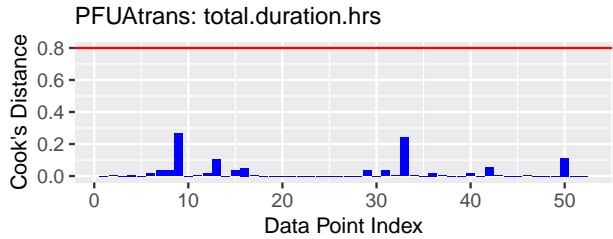
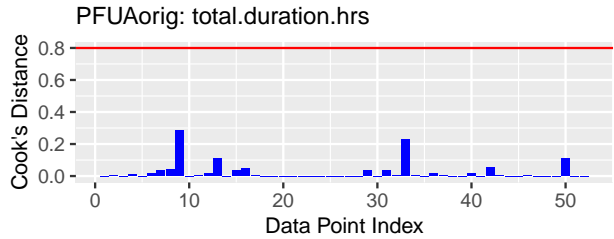






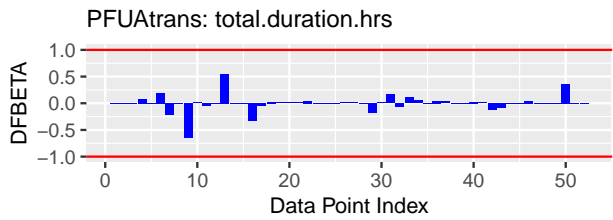
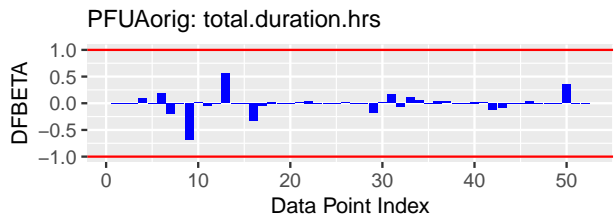
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib



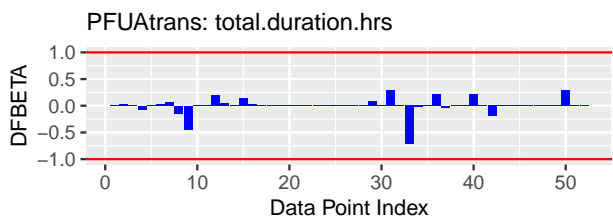
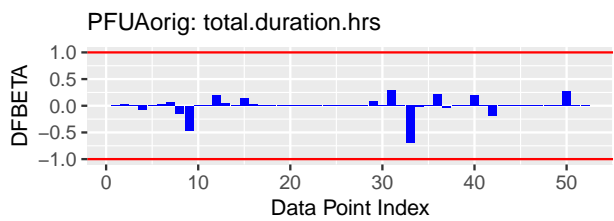
DFBETA Influence Measure on (Intercept) with Cutoff at 1

DFBETA Influence Measure on (Intercept) with Cutoff at 1



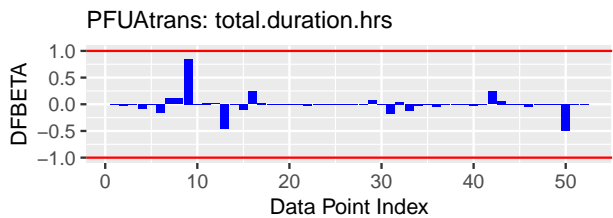
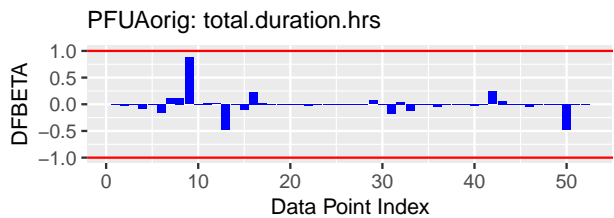
DFBETA Influence Measure on EthnicityHispanic with Cutoff at 1

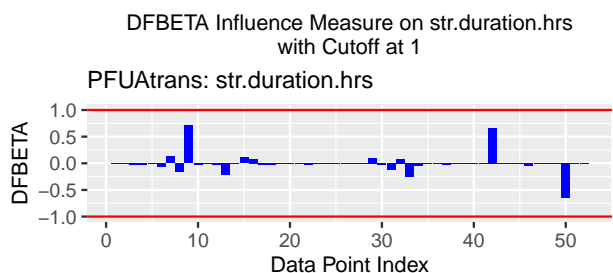
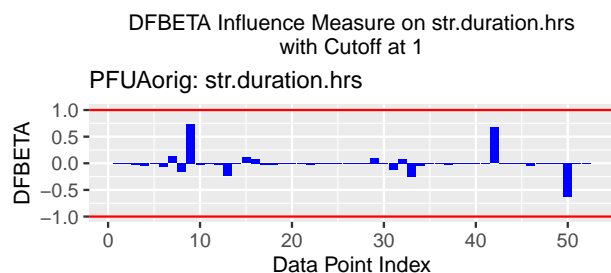
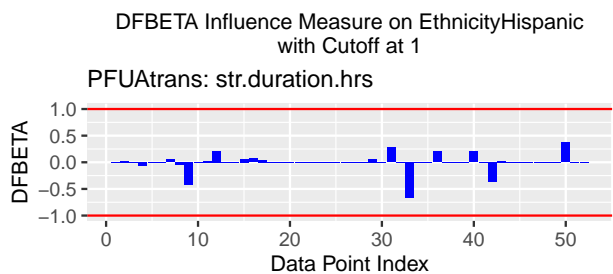
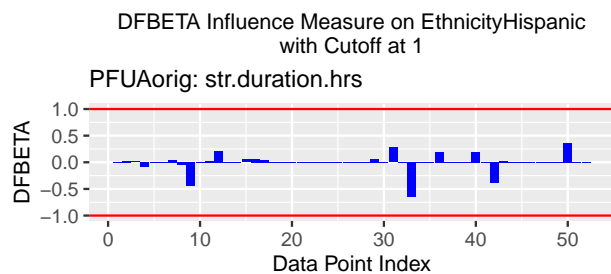
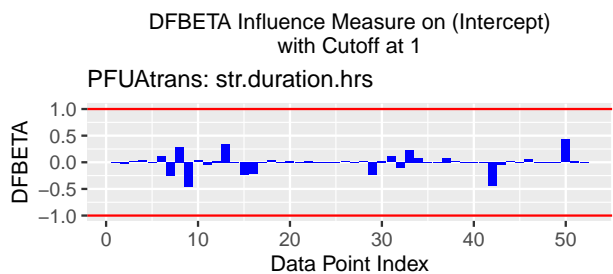
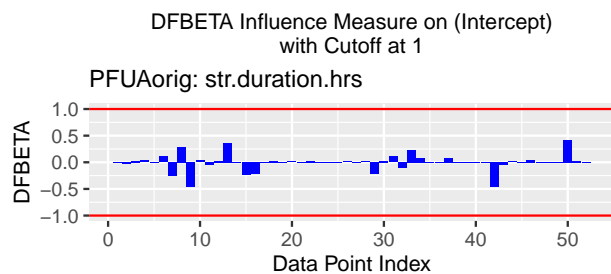
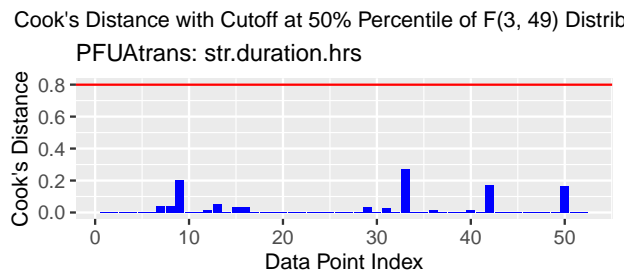
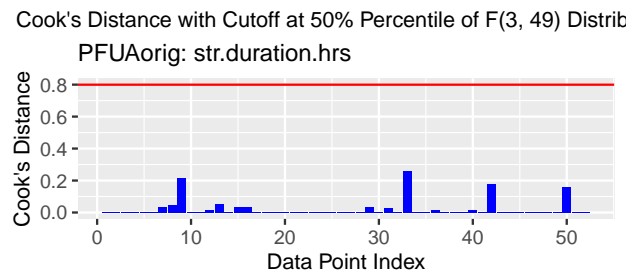
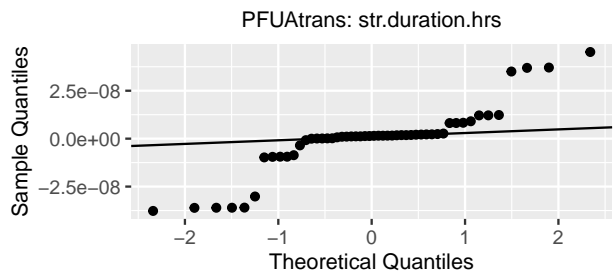
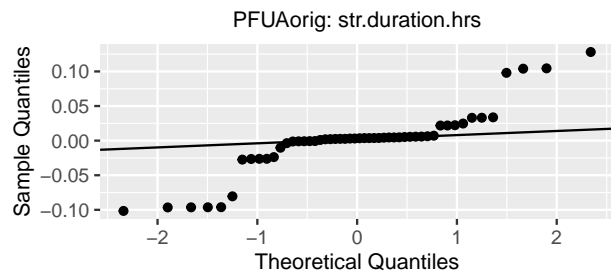
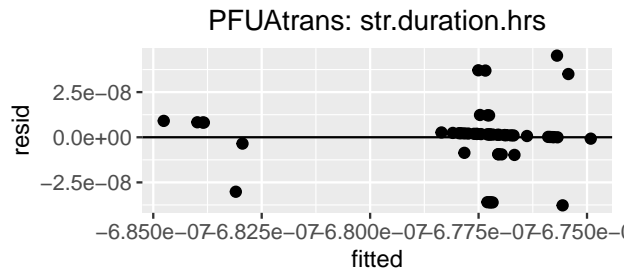
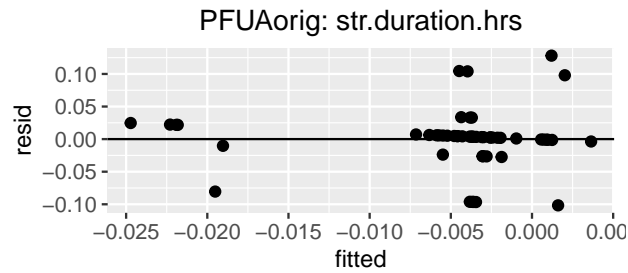
DFBETA Influence Measure on EthnicityHispanic with Cutoff at 1

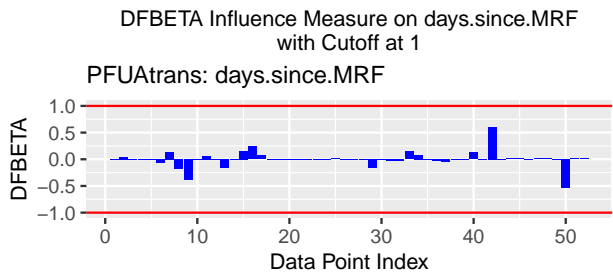
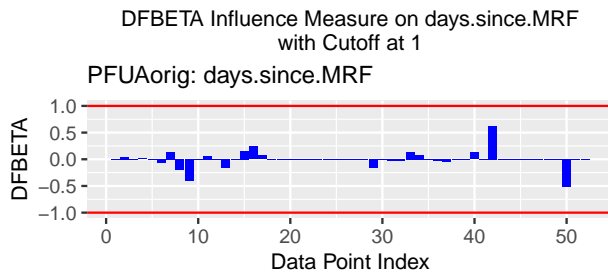
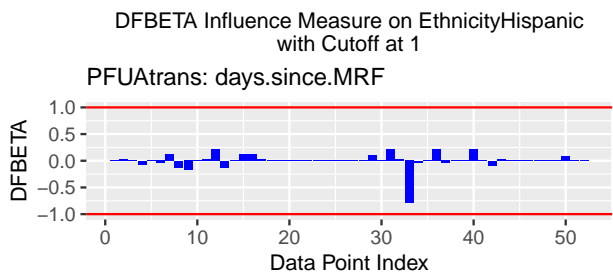
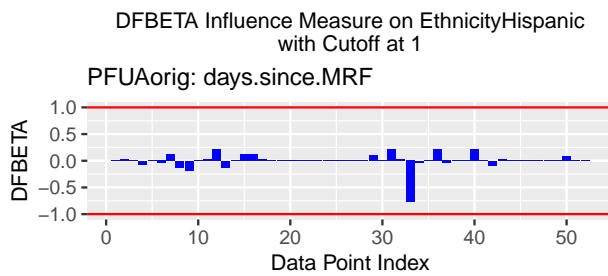
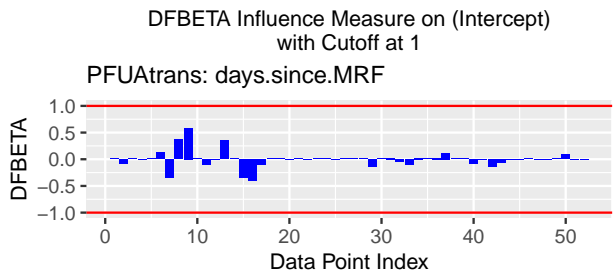
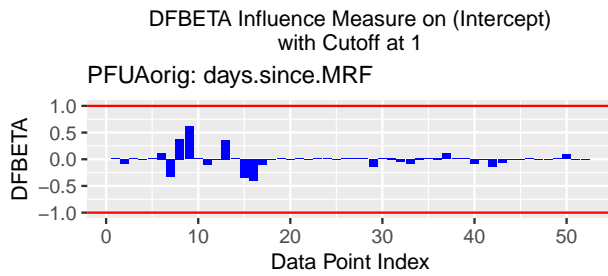
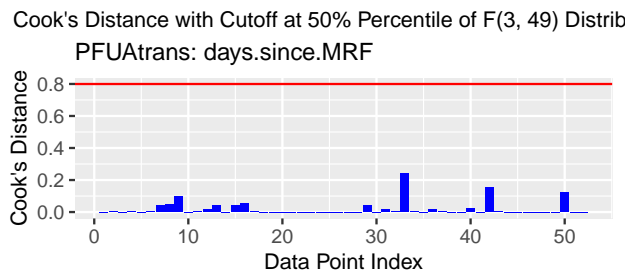
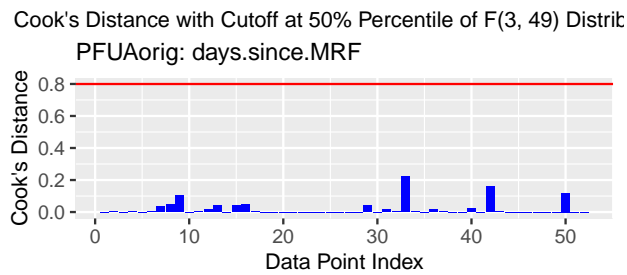
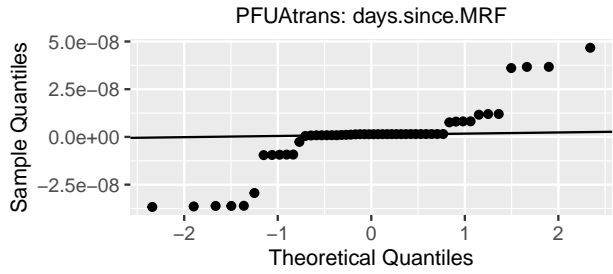
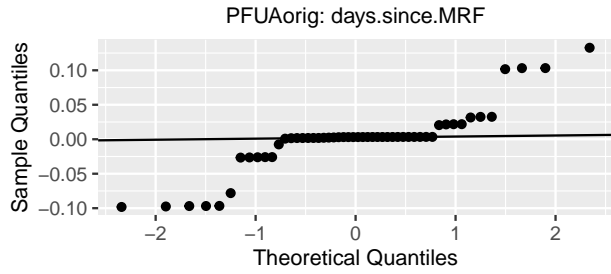
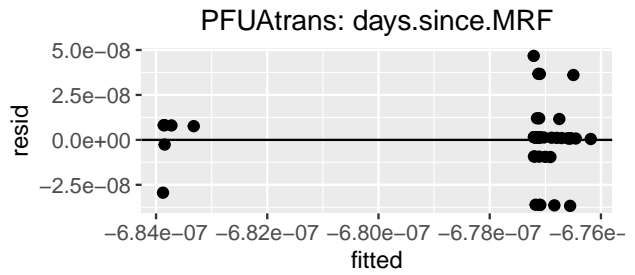
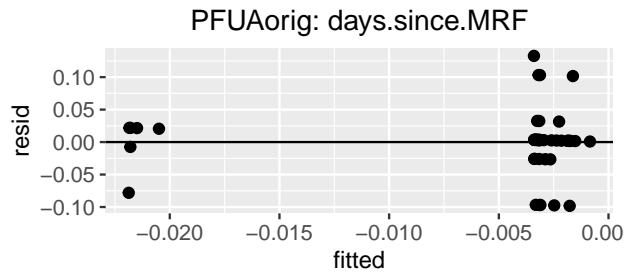


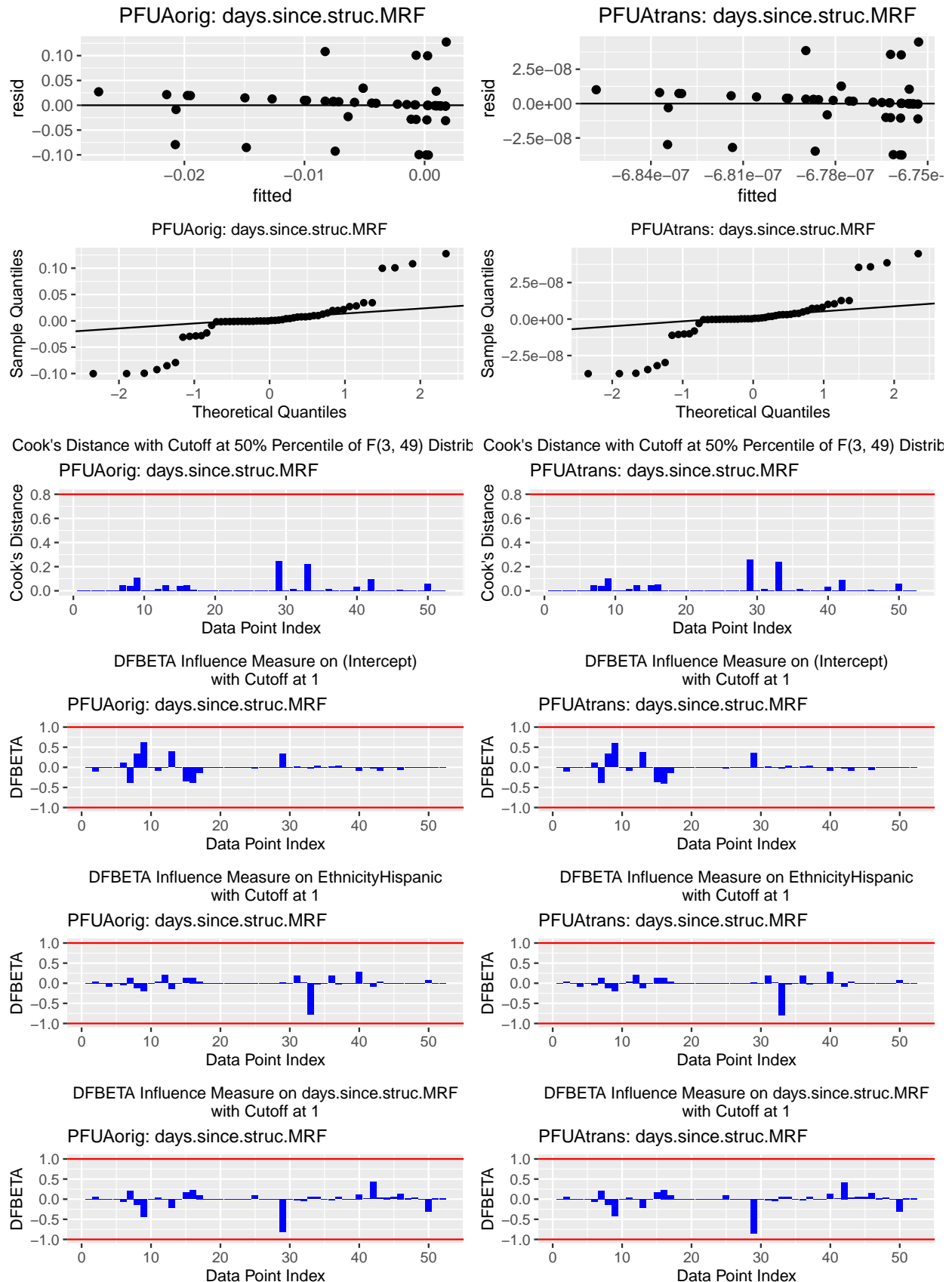
DFBETA Influence Measure on total.duration.hrs with Cutoff at 1

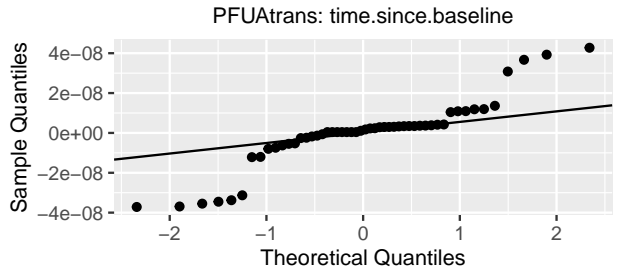
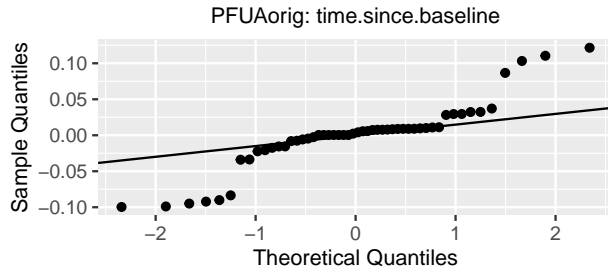
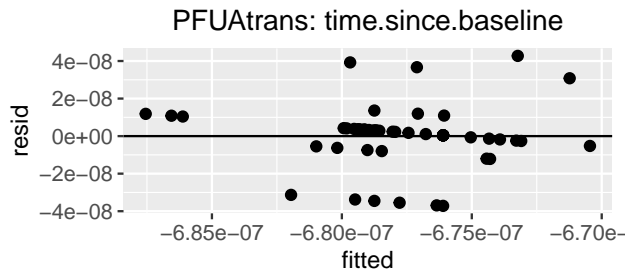
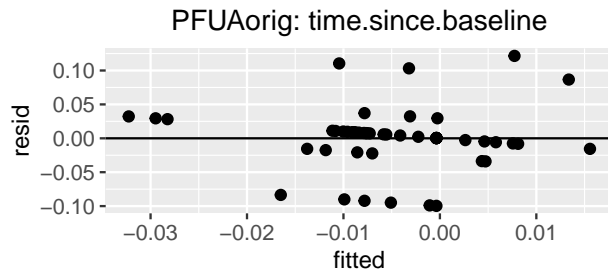
DFBETA Influence Measure on total.duration.hrs with Cutoff at 1





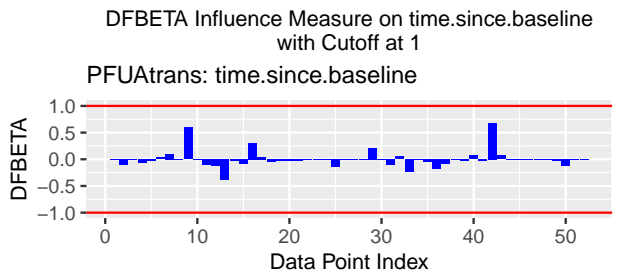
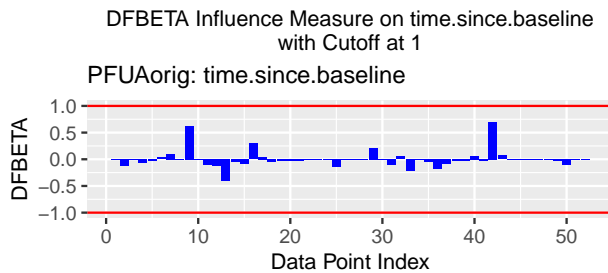
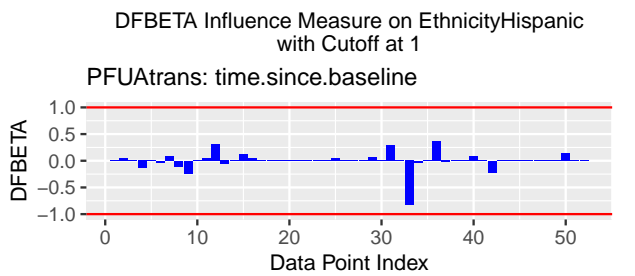
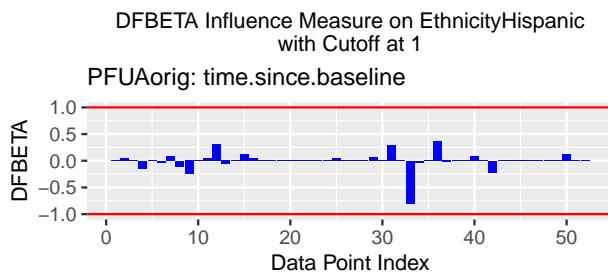
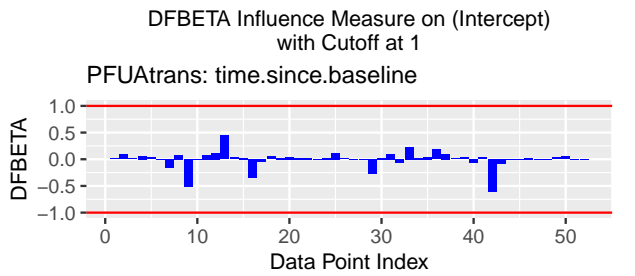
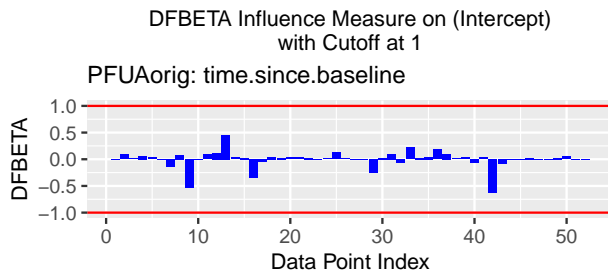
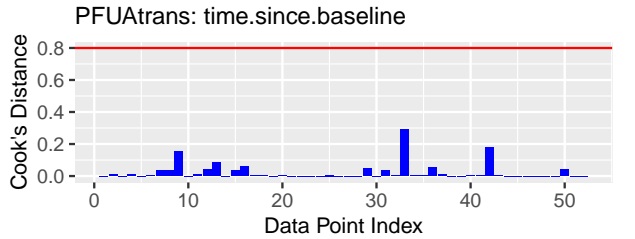
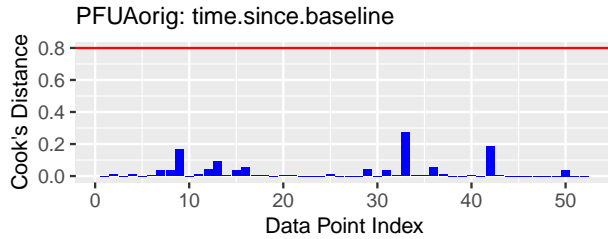




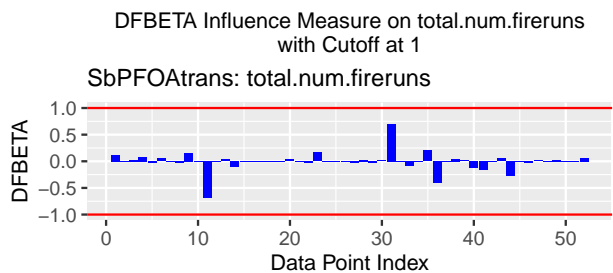
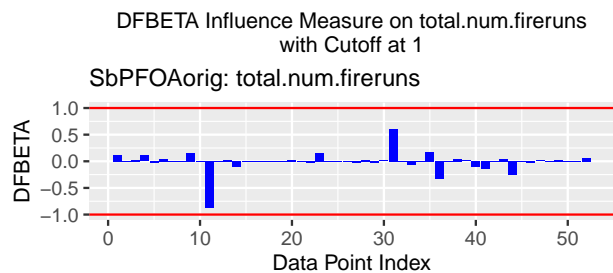
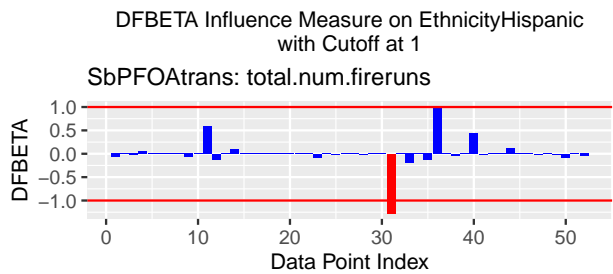
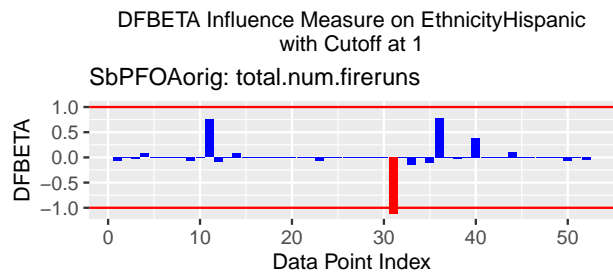
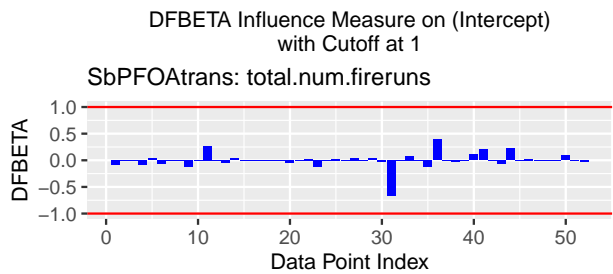
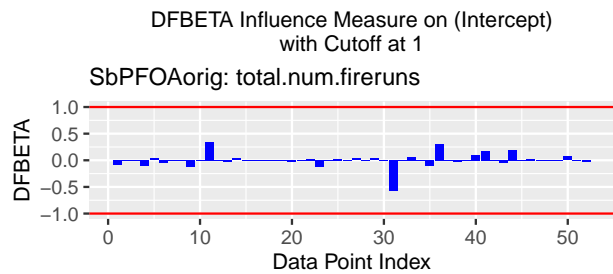
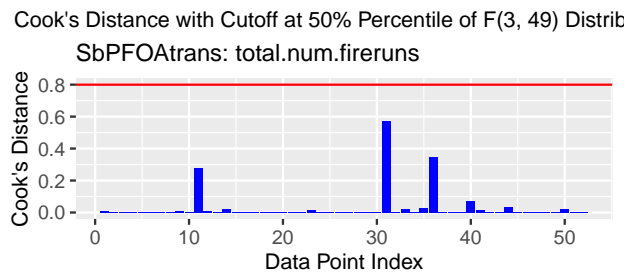
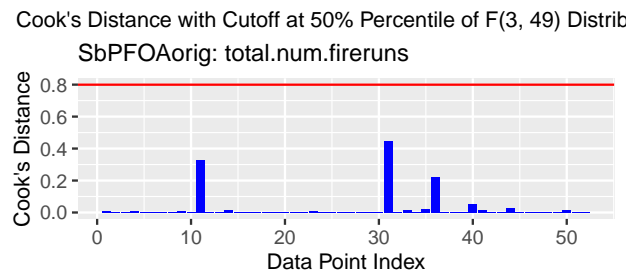
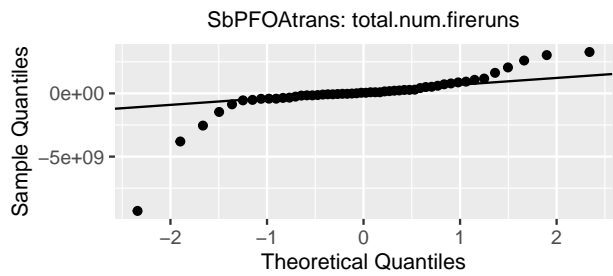
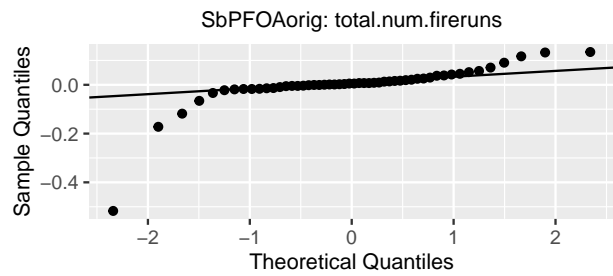
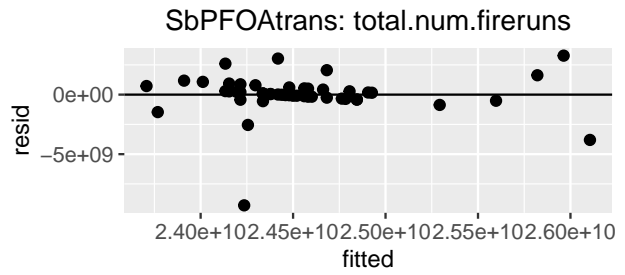
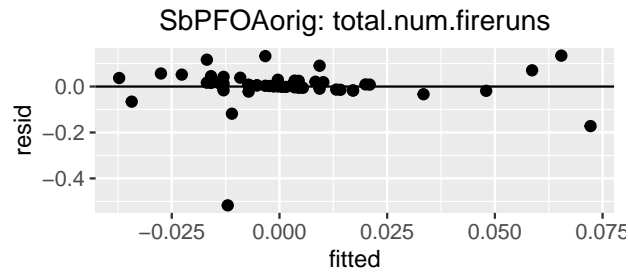


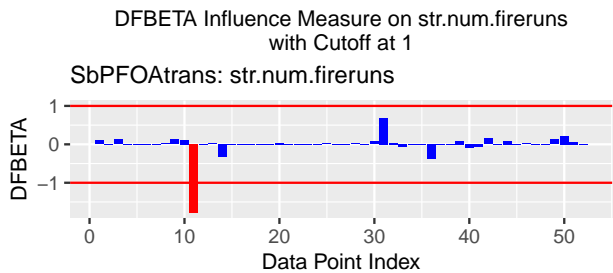
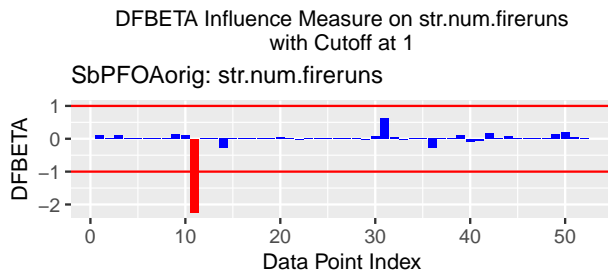
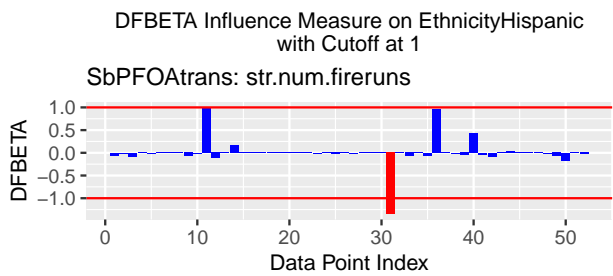
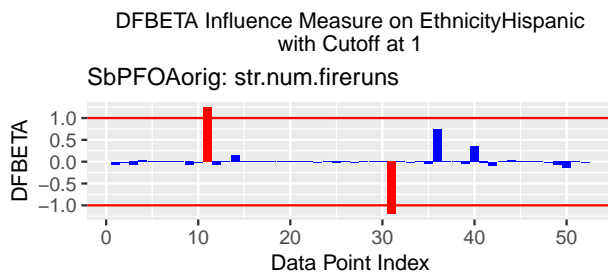
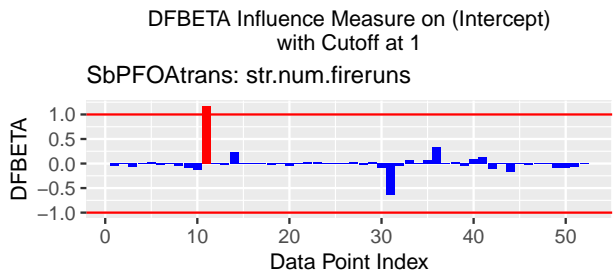
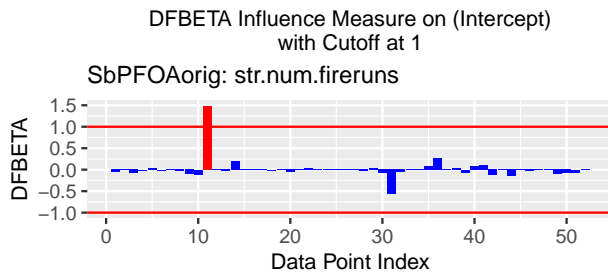
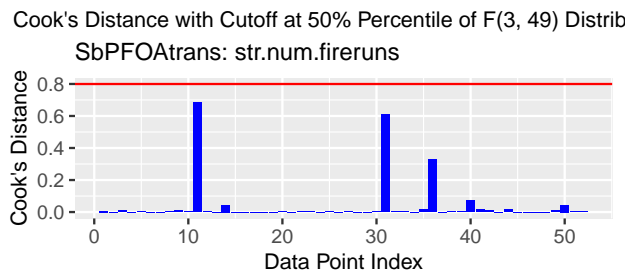
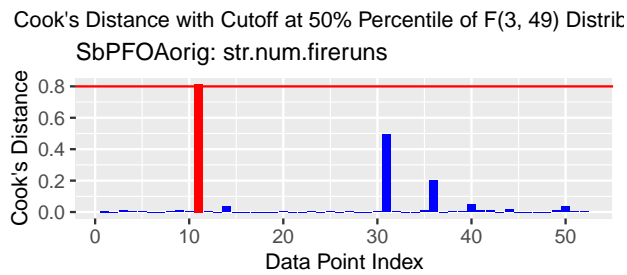
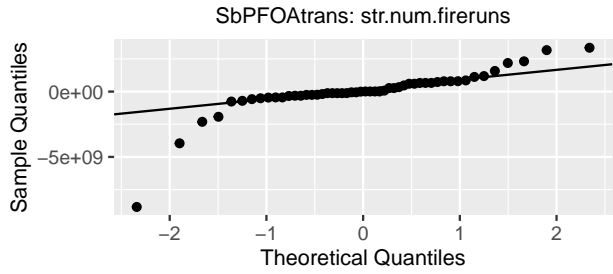
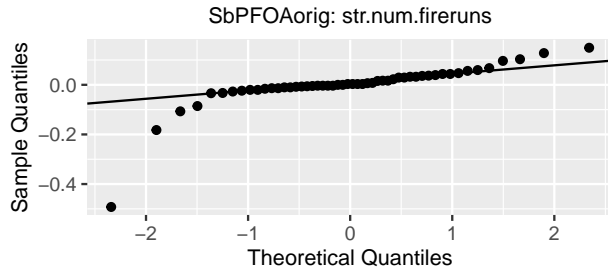
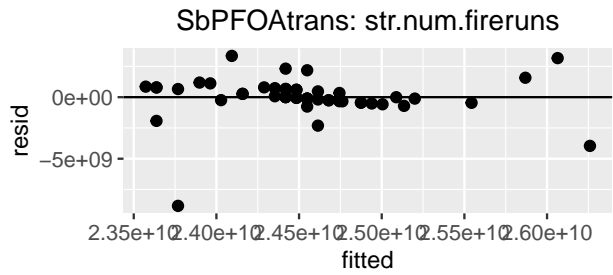
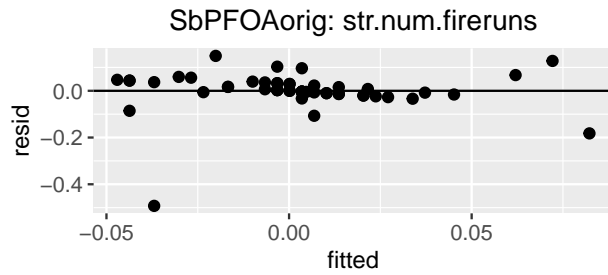
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

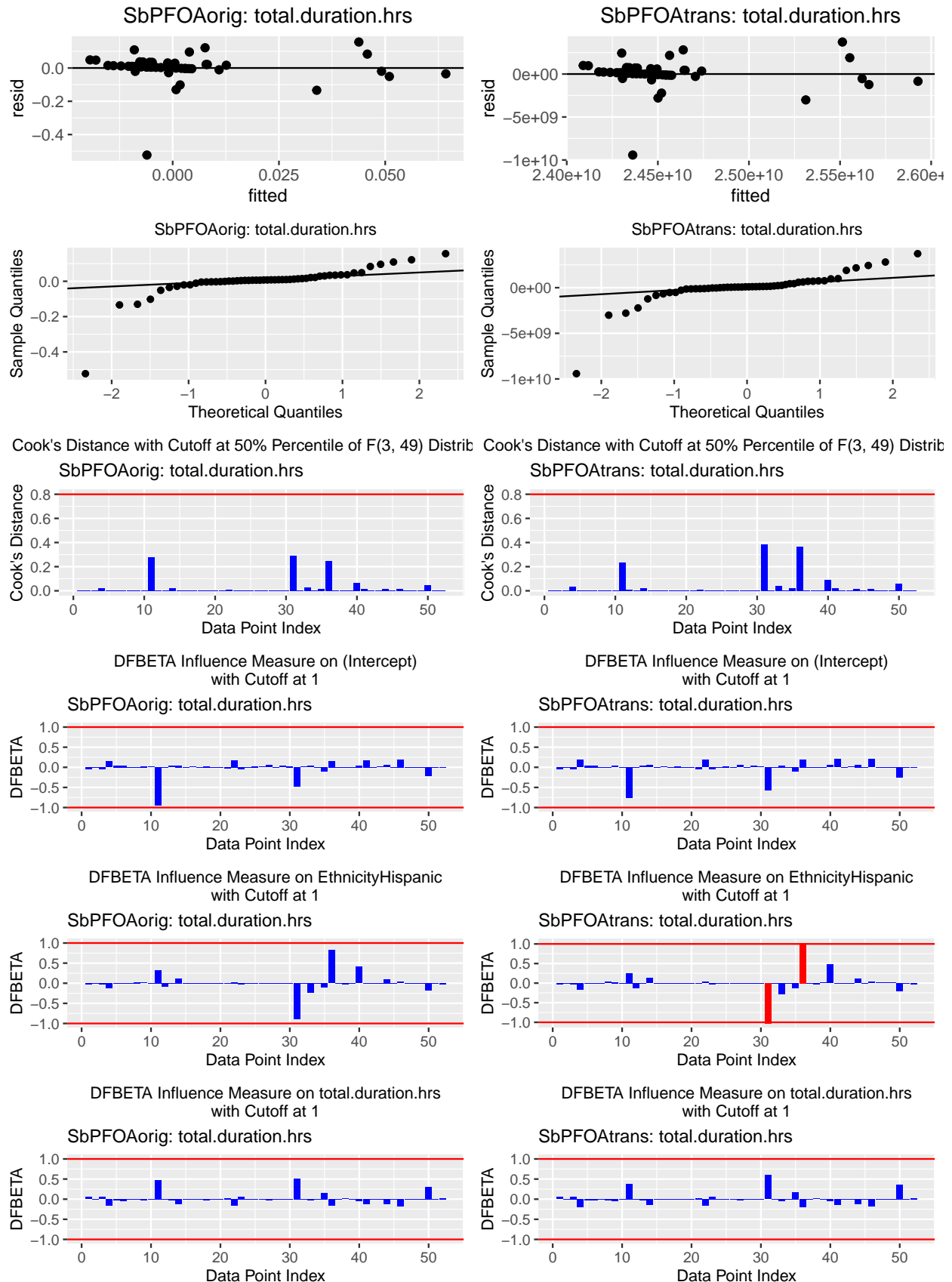
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

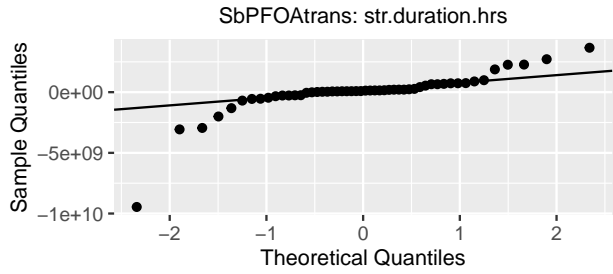
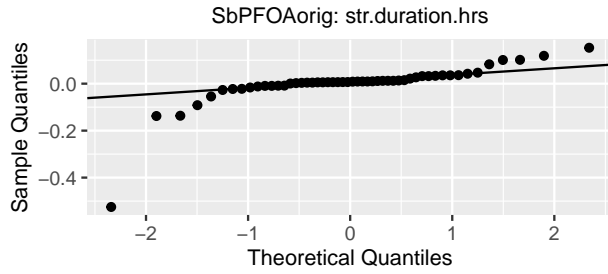
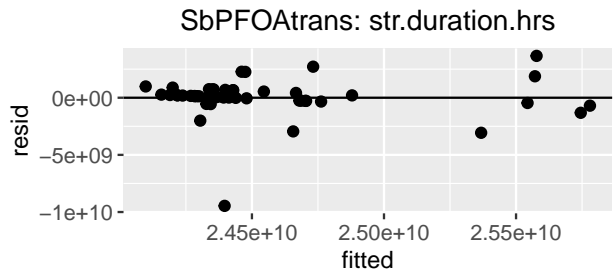
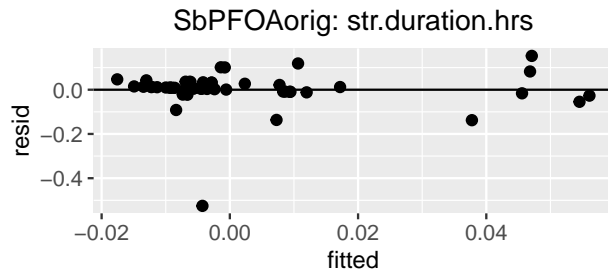






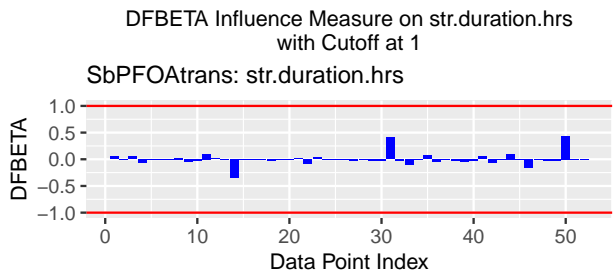
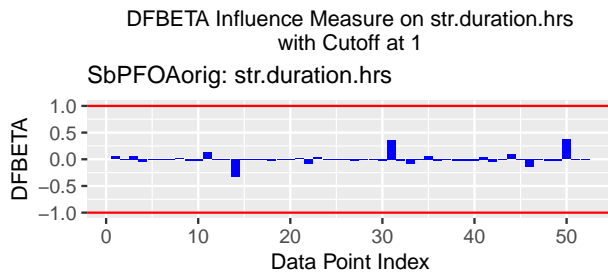
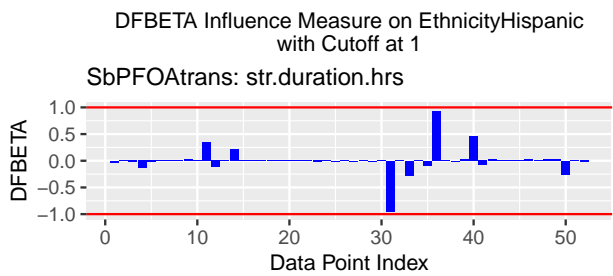
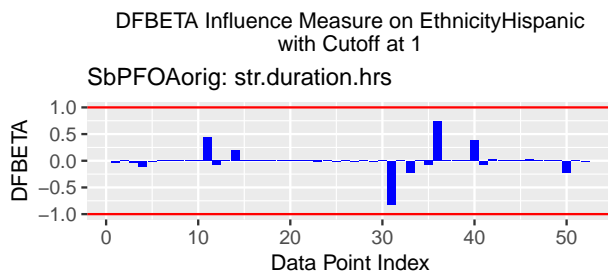
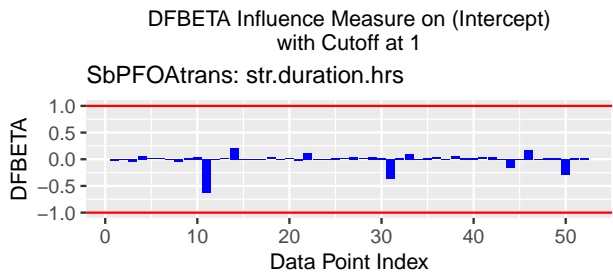
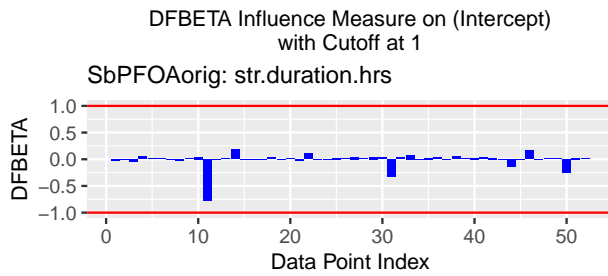
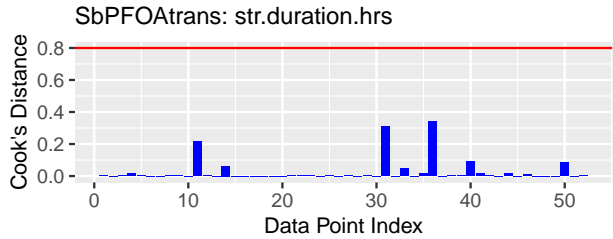
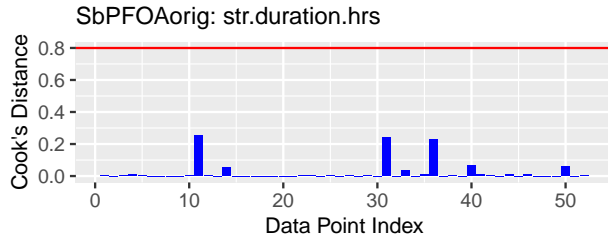


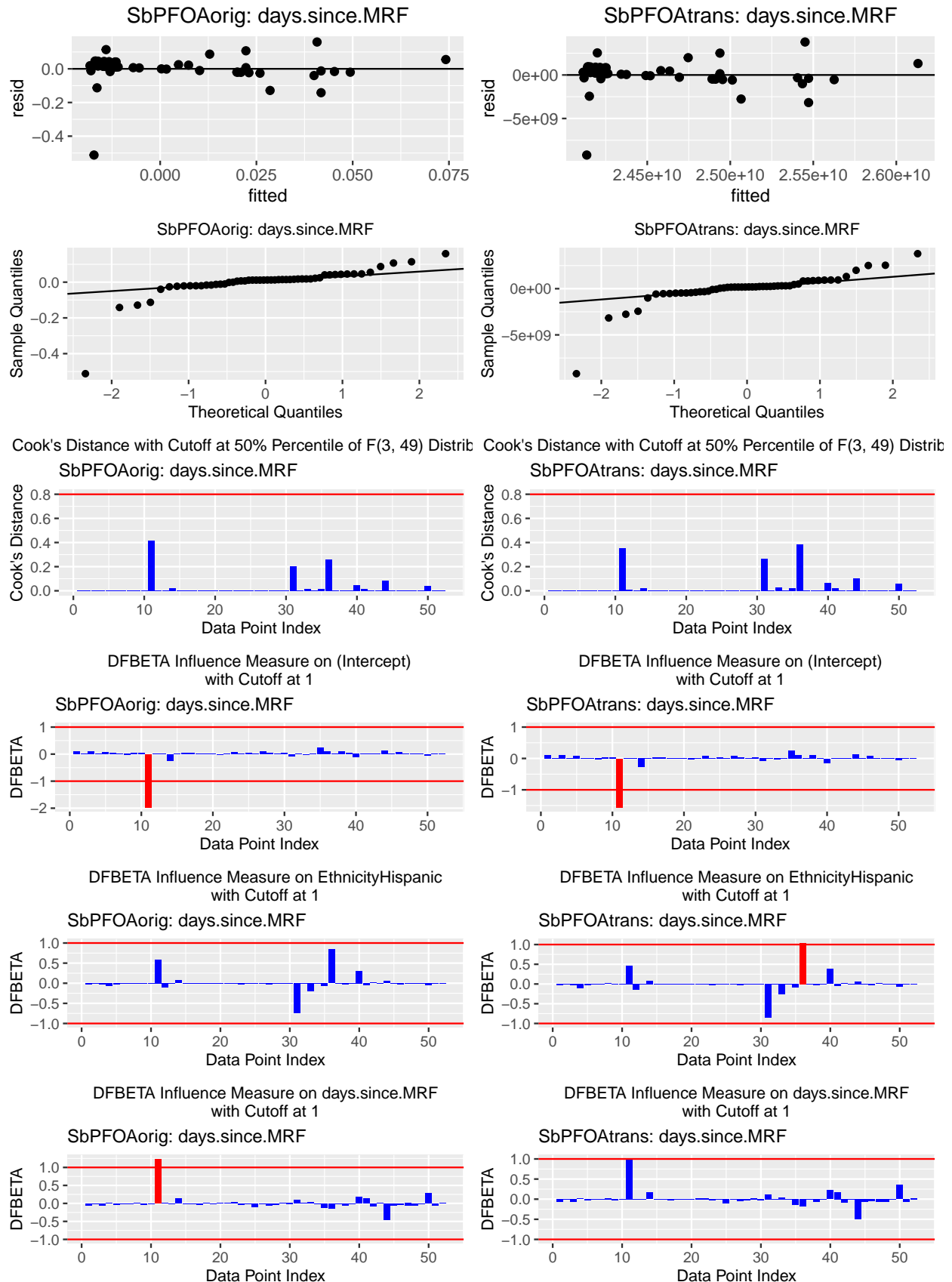


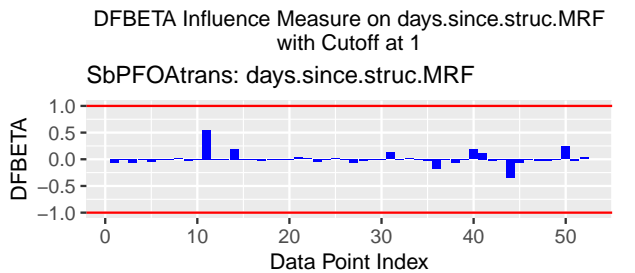
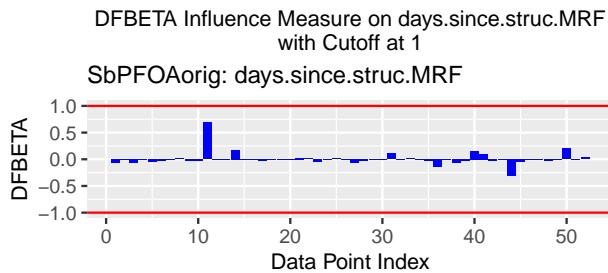
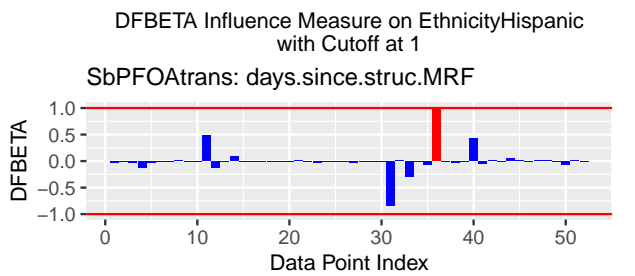
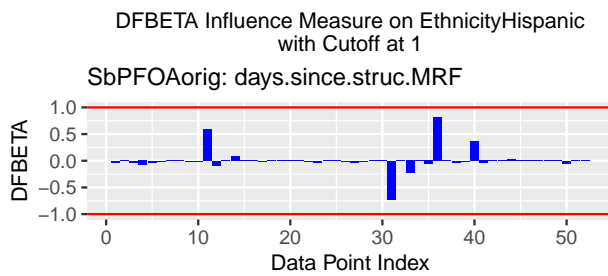
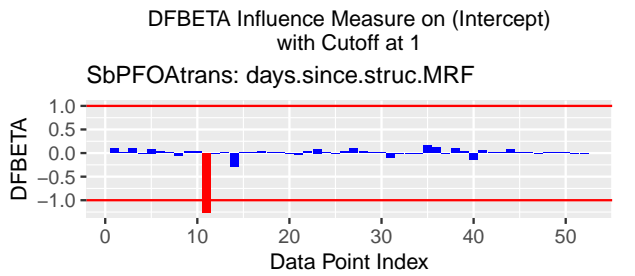
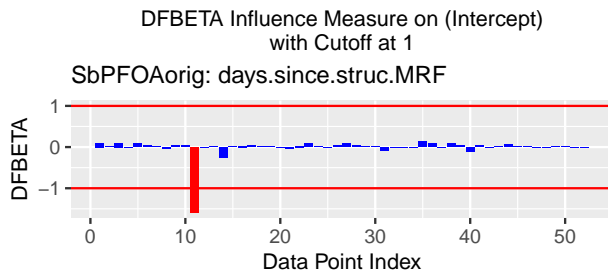
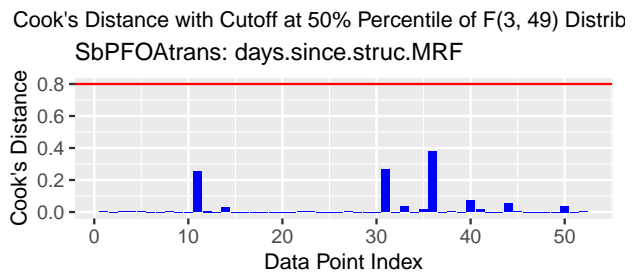
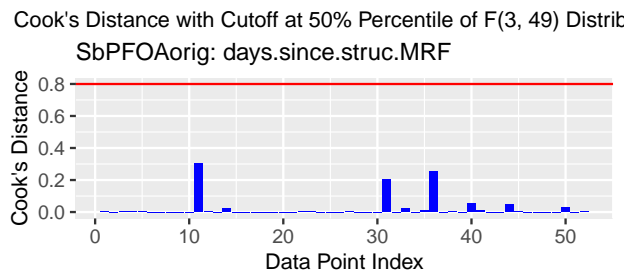
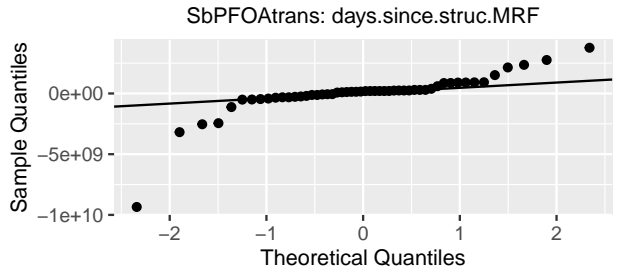
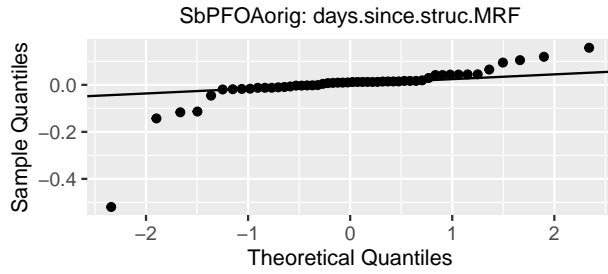
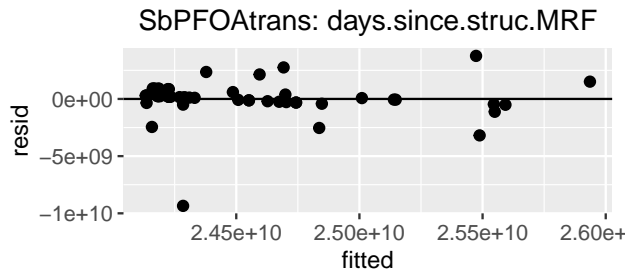
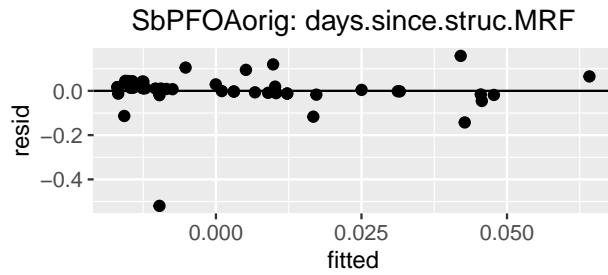


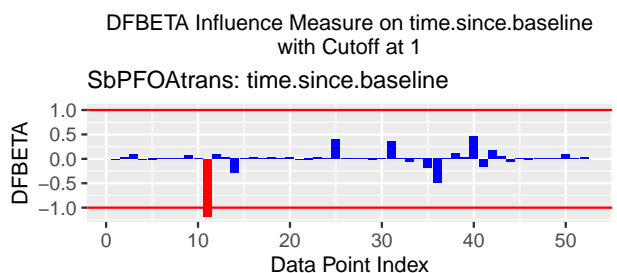
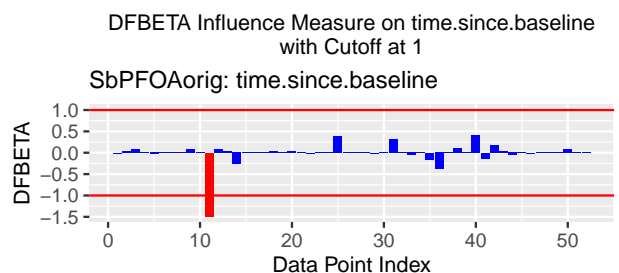
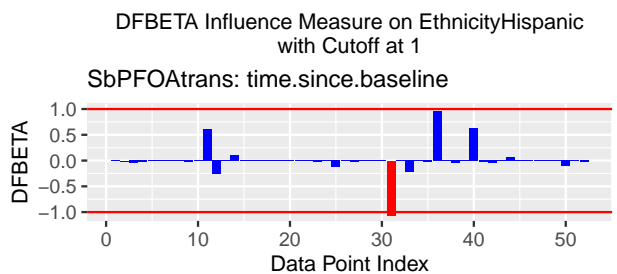
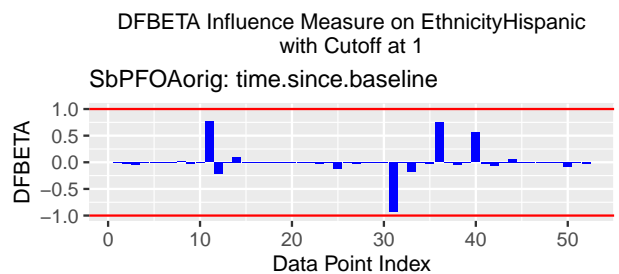
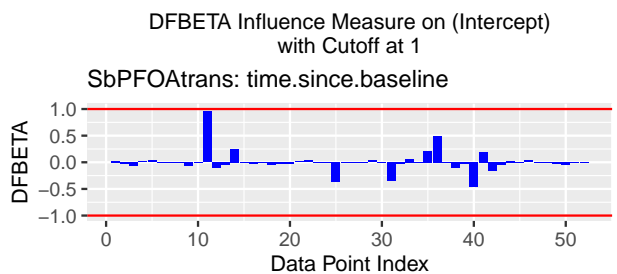
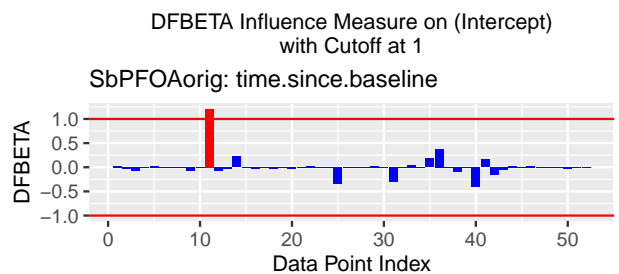
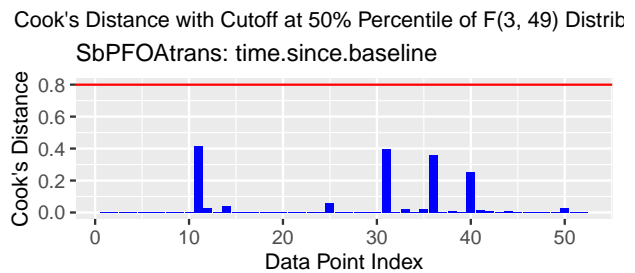
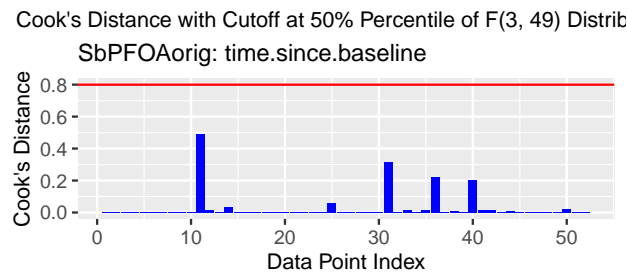
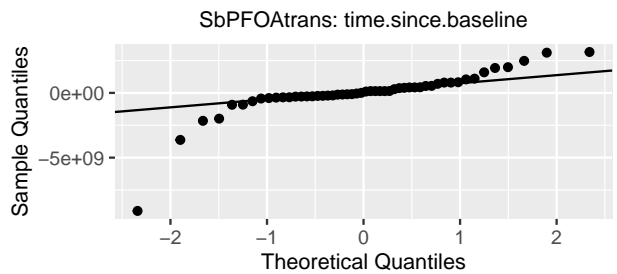
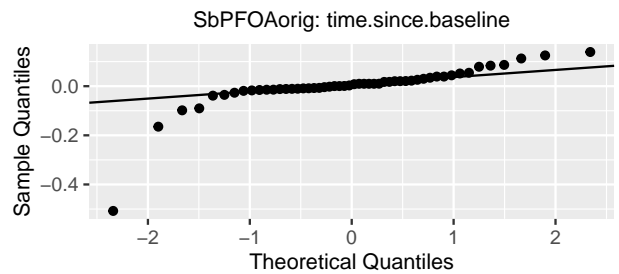
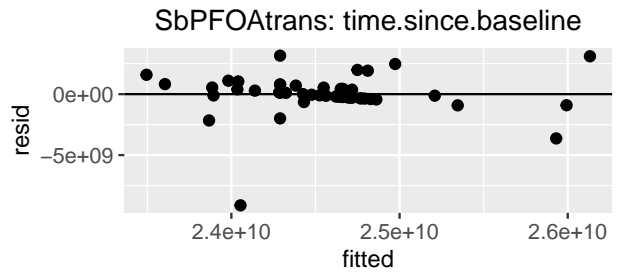
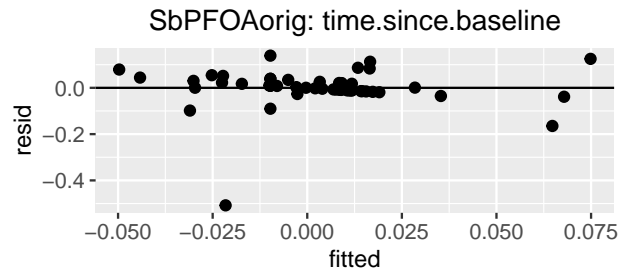
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

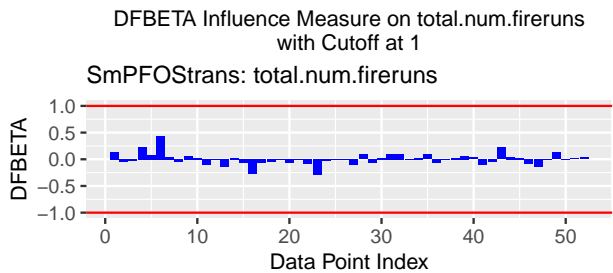
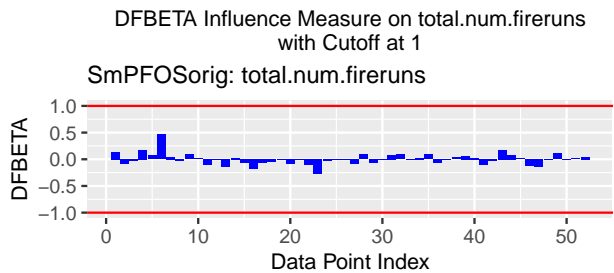
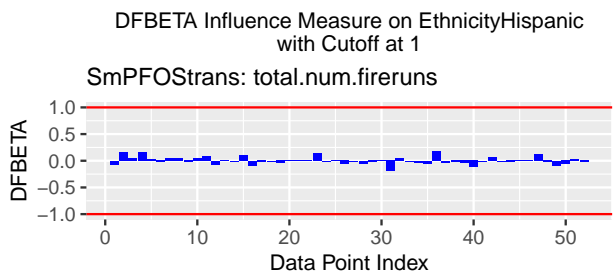
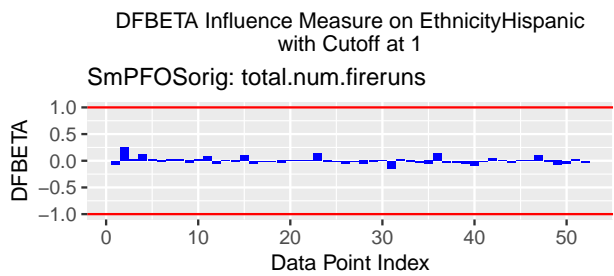
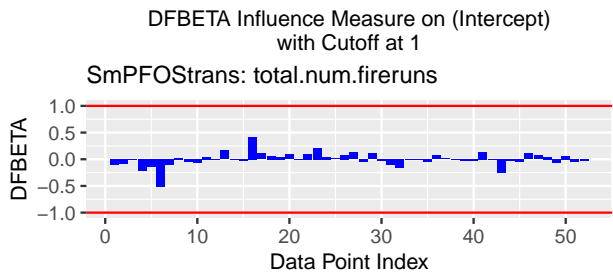
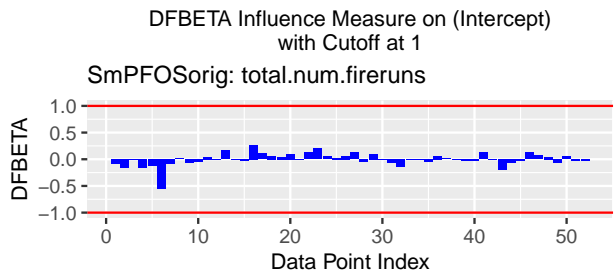
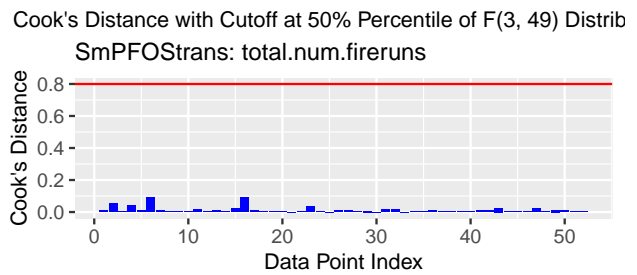
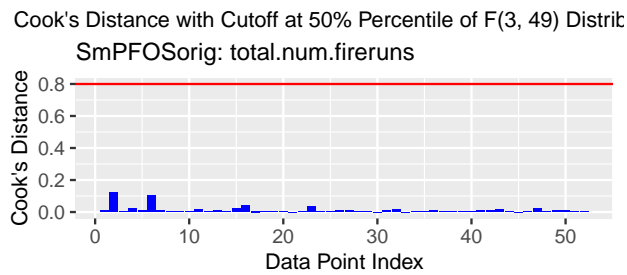
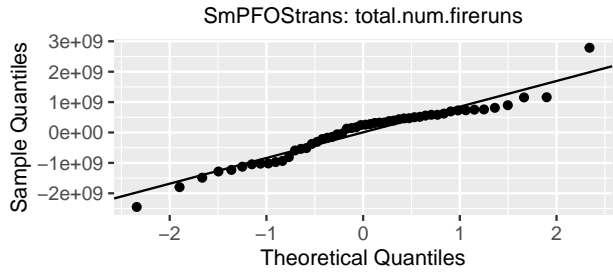
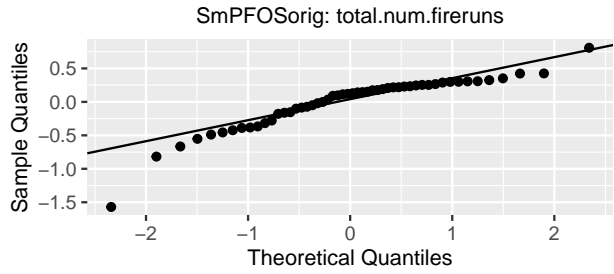
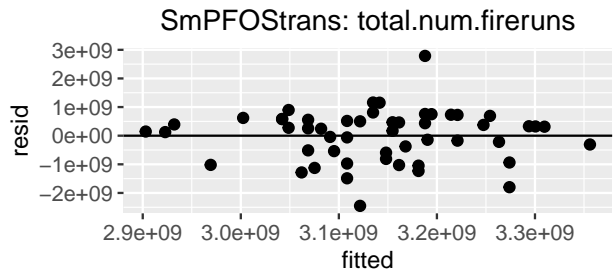
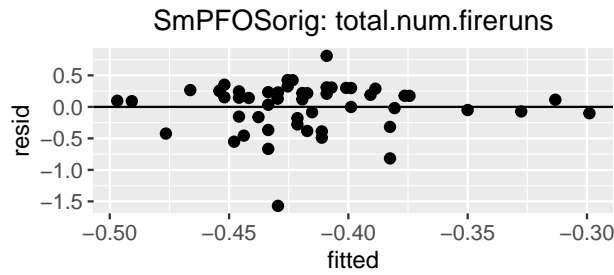
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib



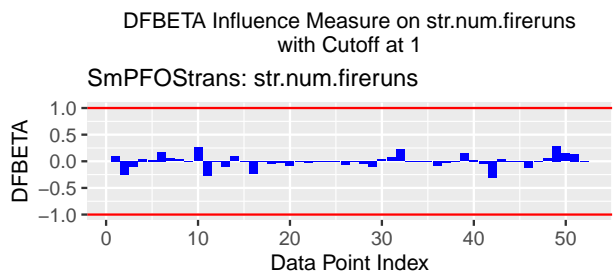
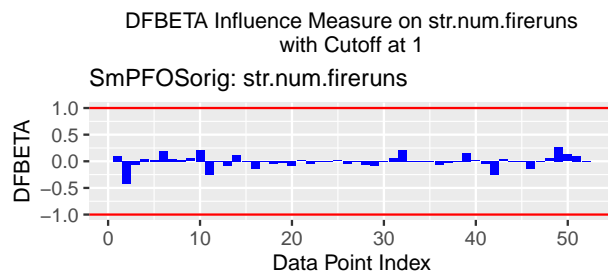
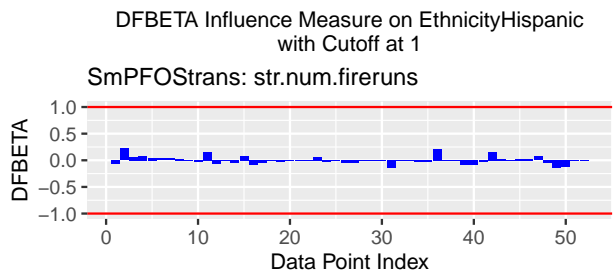
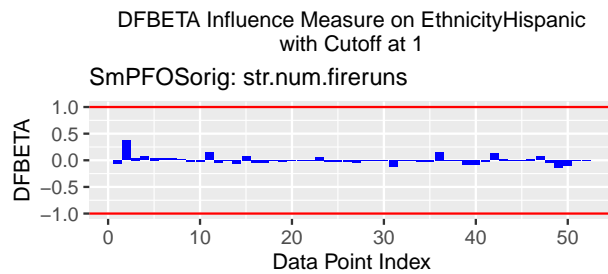
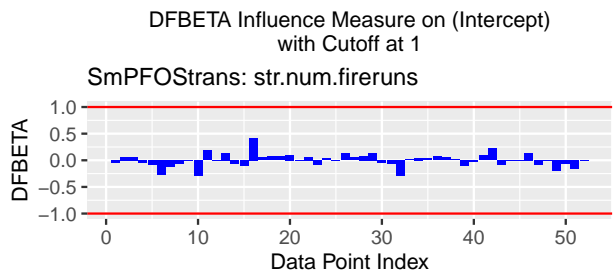
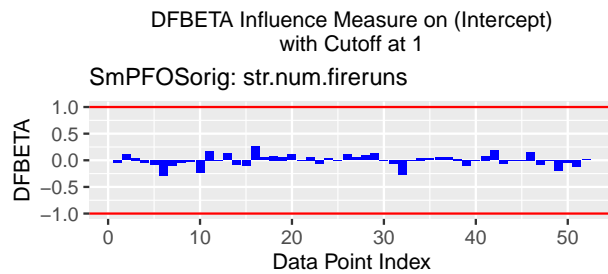
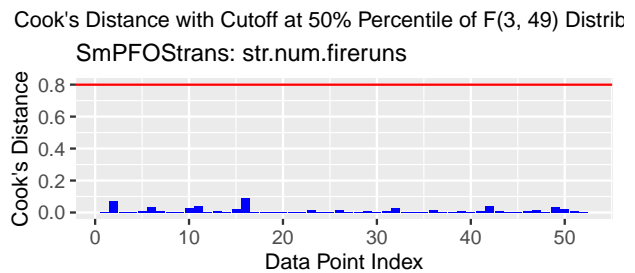
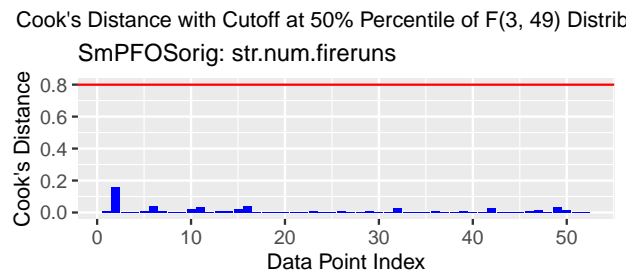
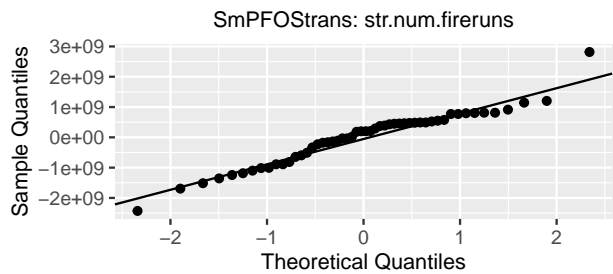
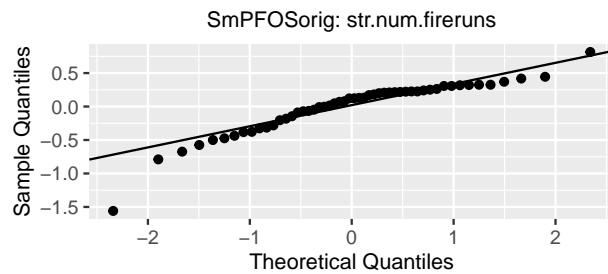
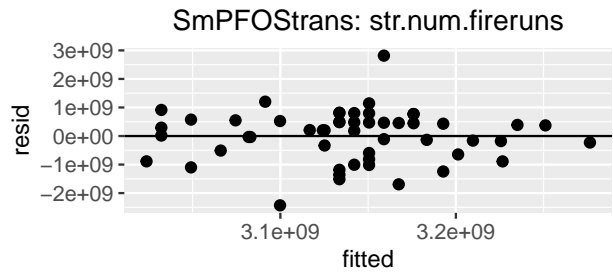
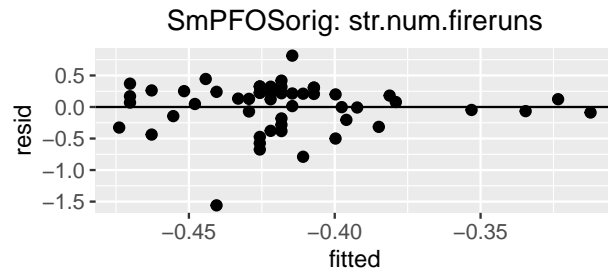


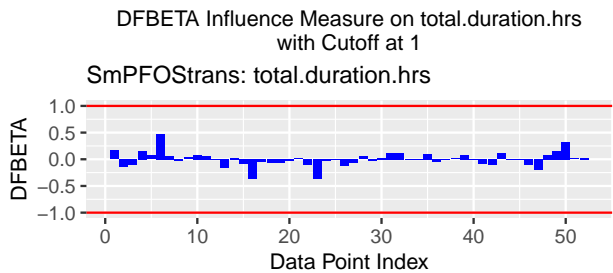
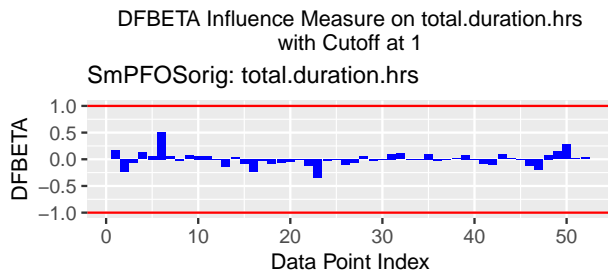
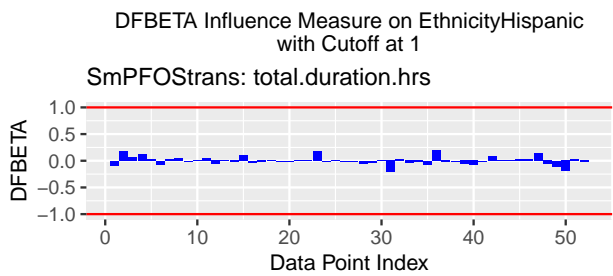
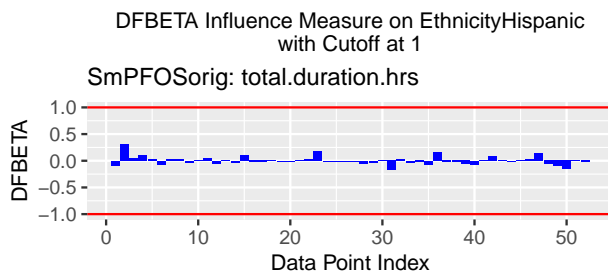
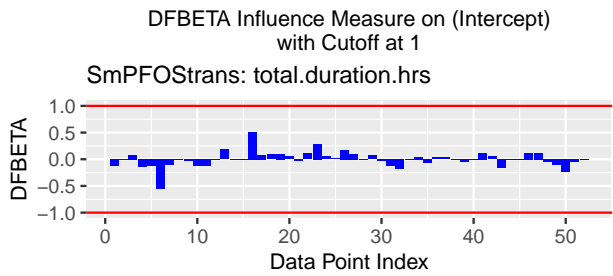
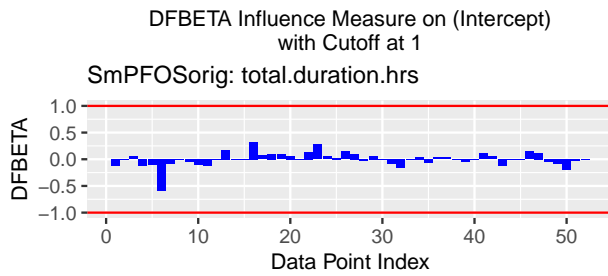
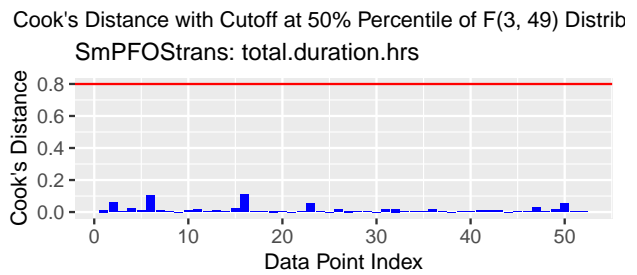
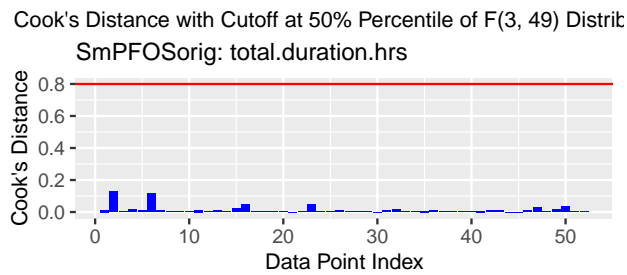
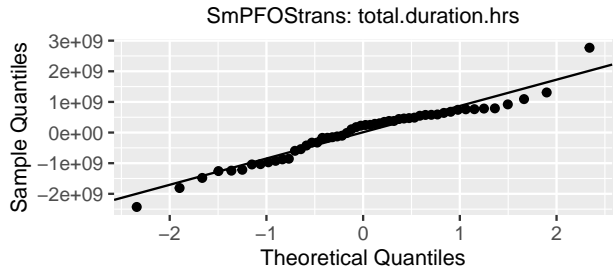
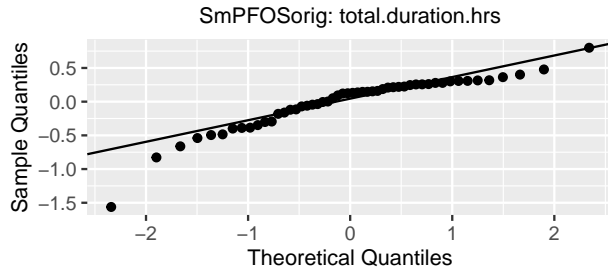
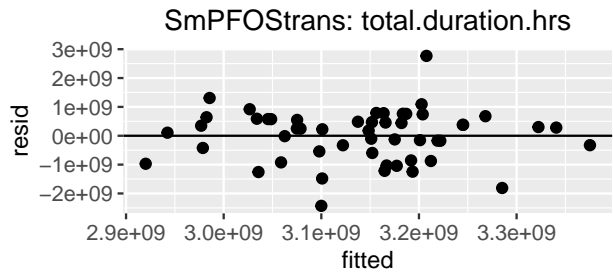
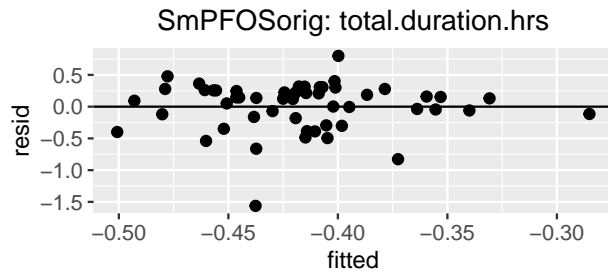


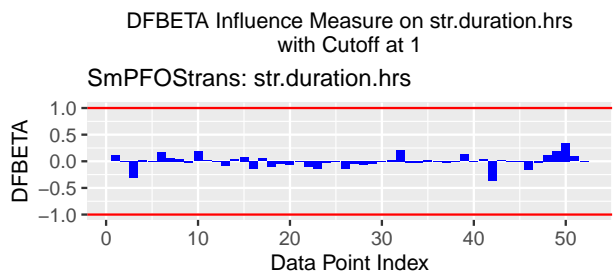
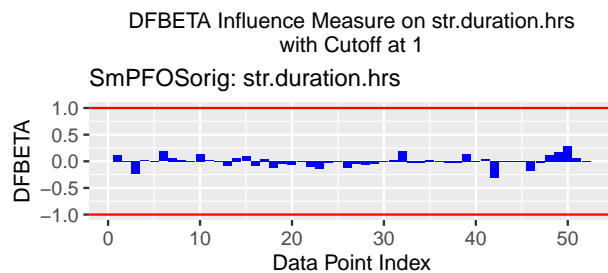
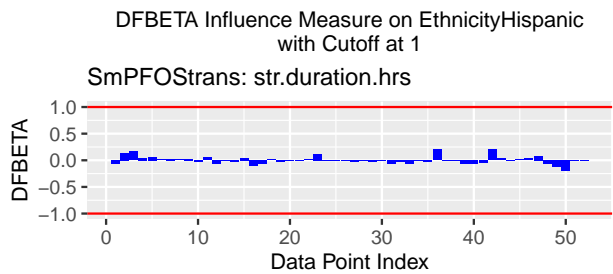
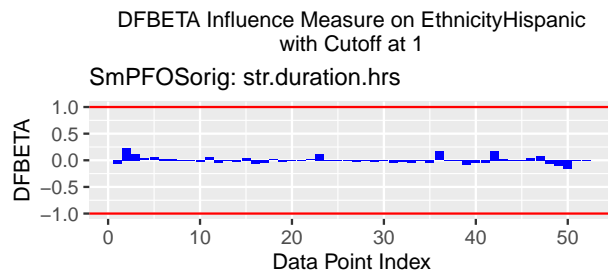
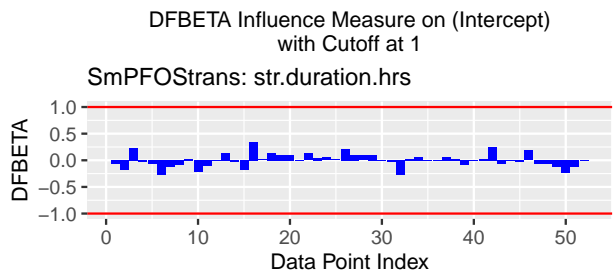
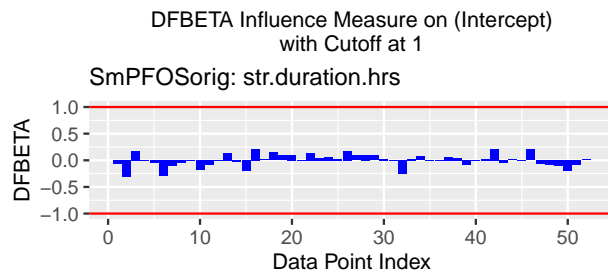
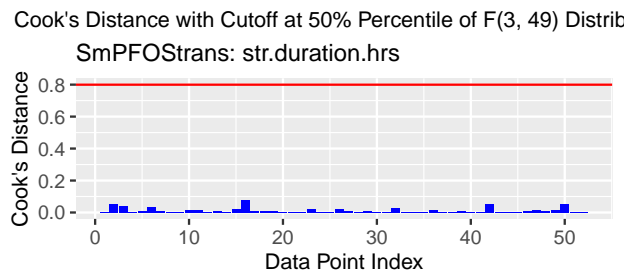
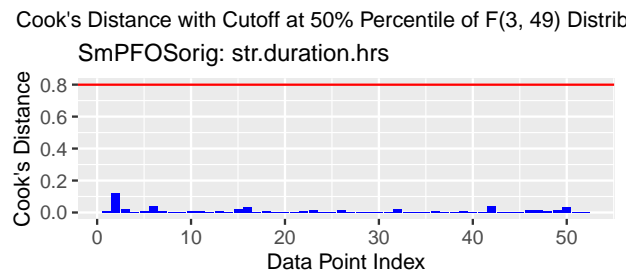
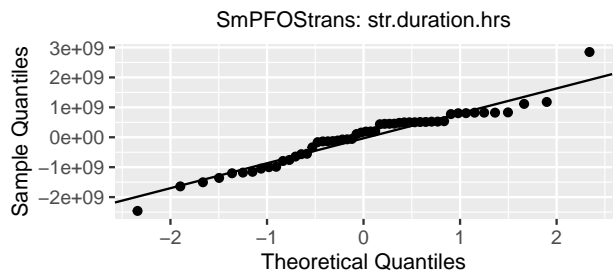
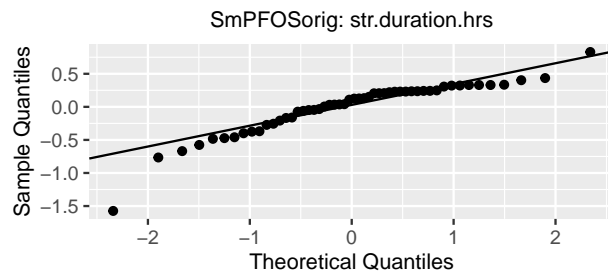
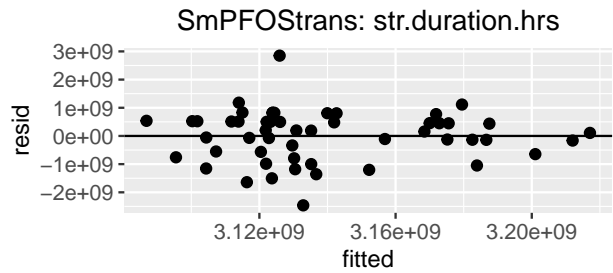
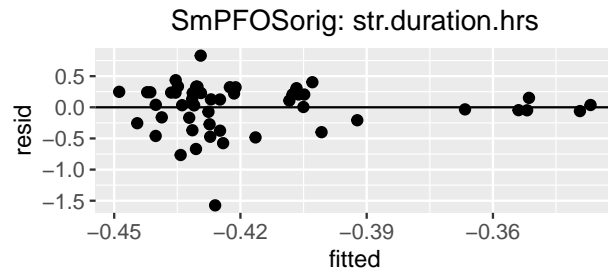


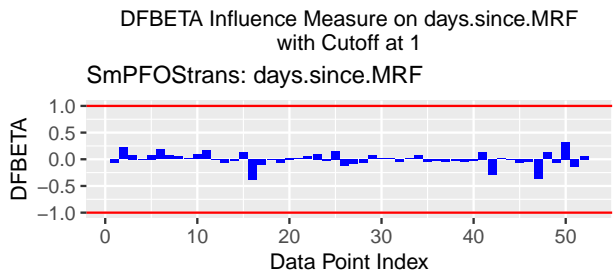
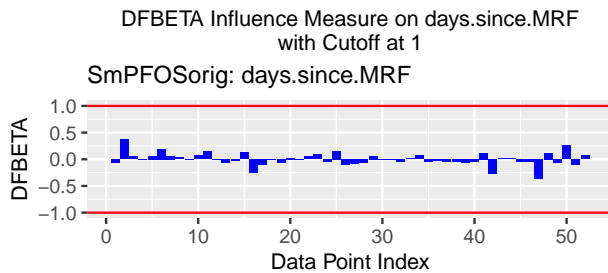
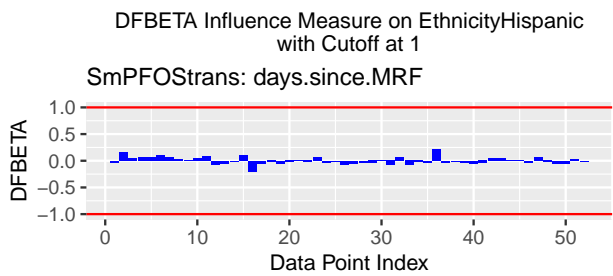
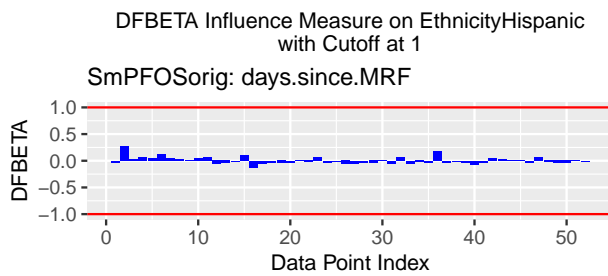
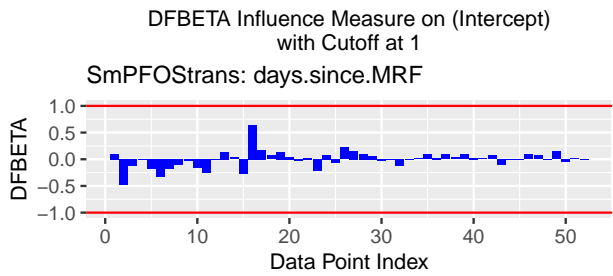
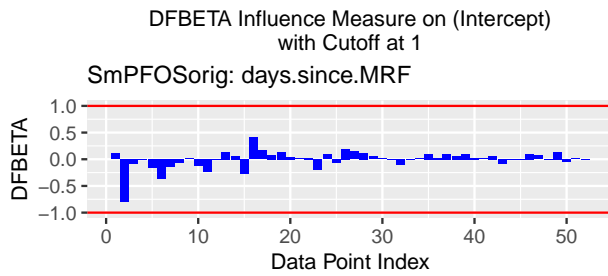
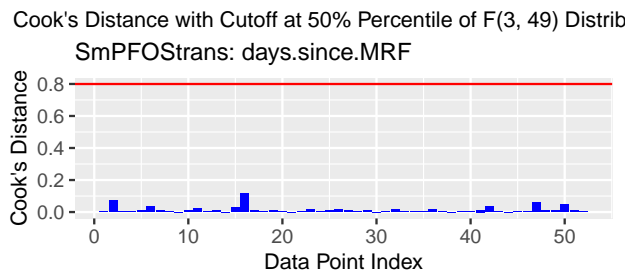
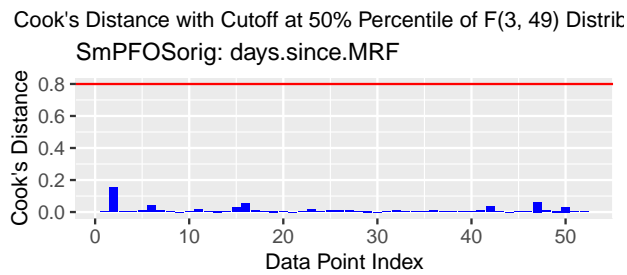
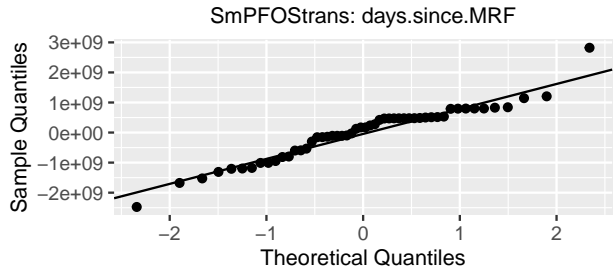
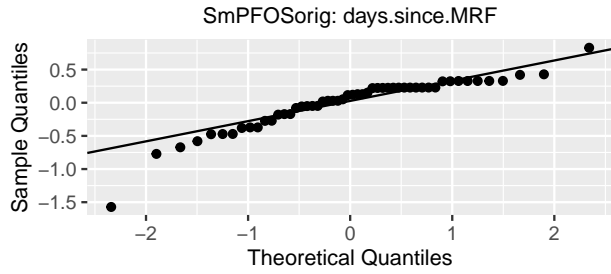
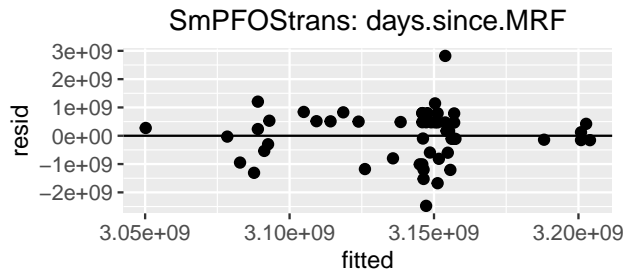
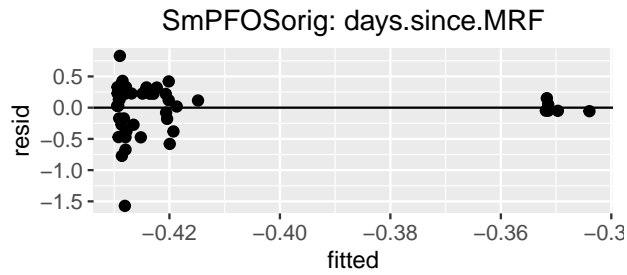


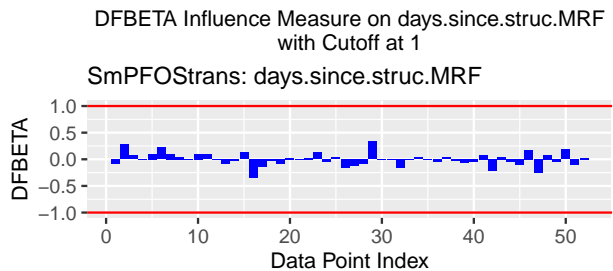
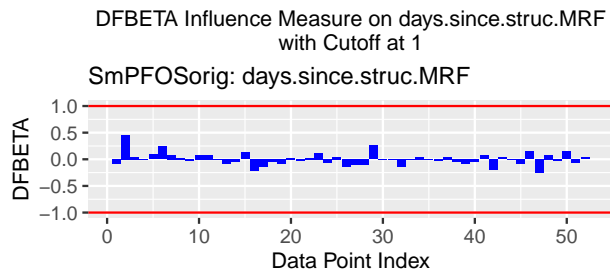
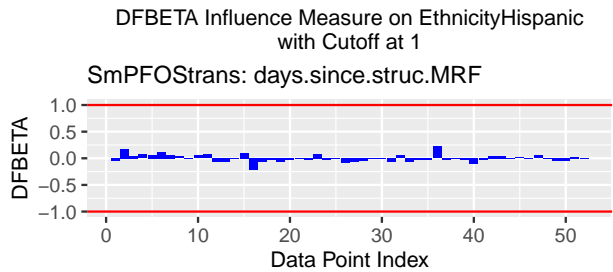
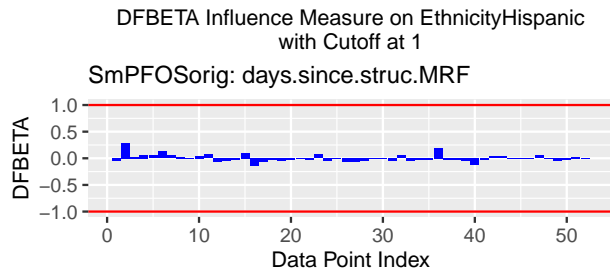
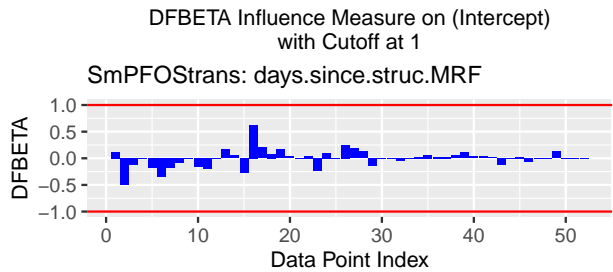
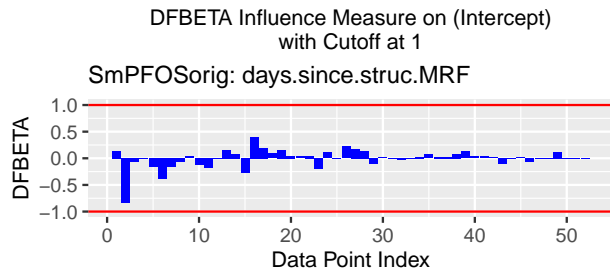
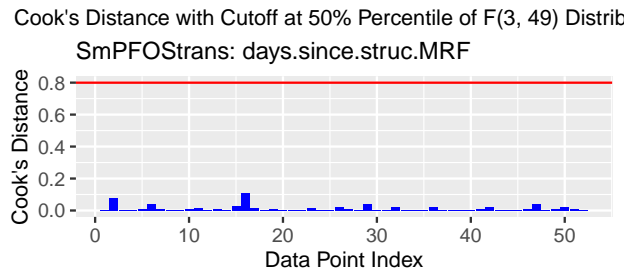
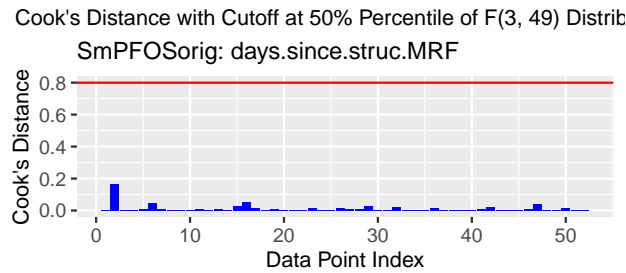
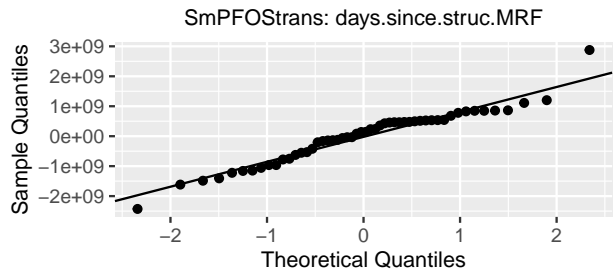
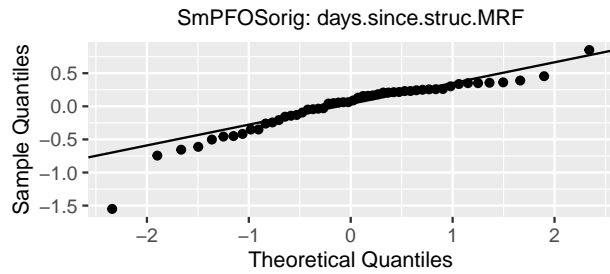
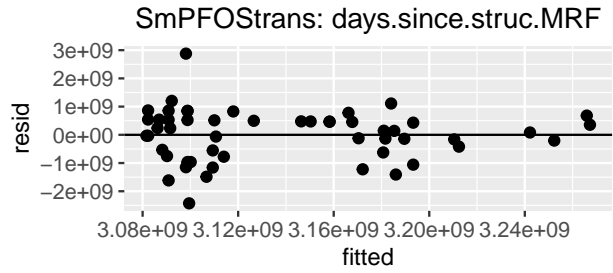
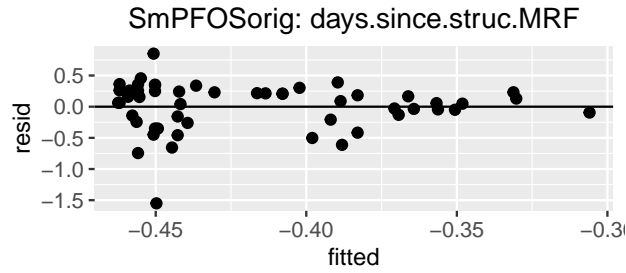


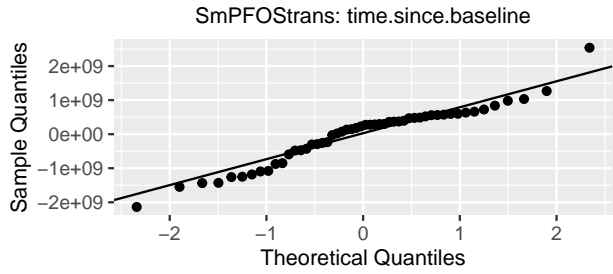
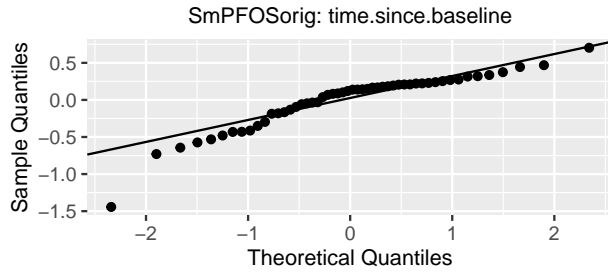
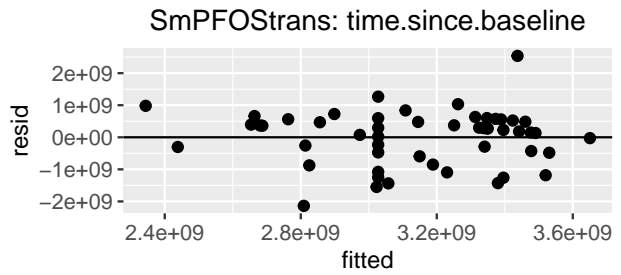
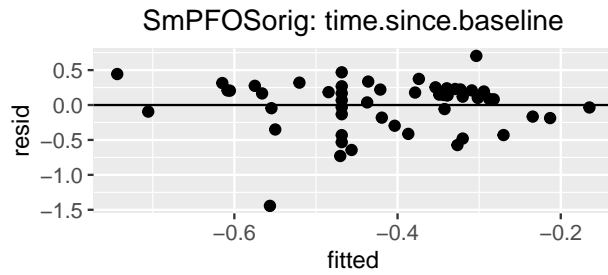






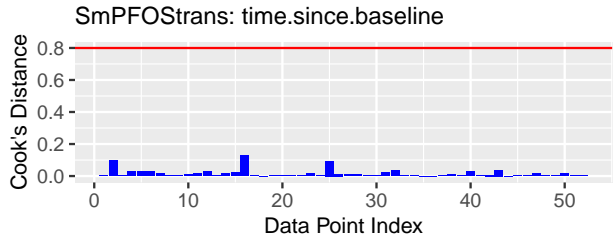
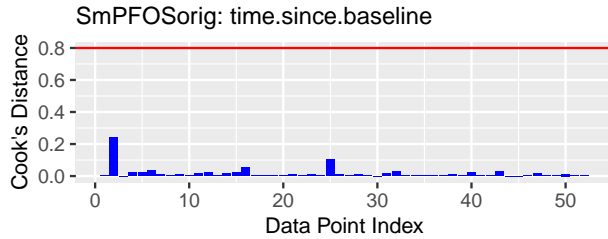






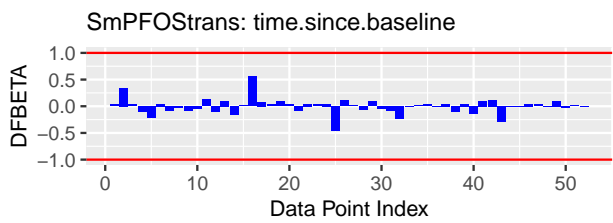
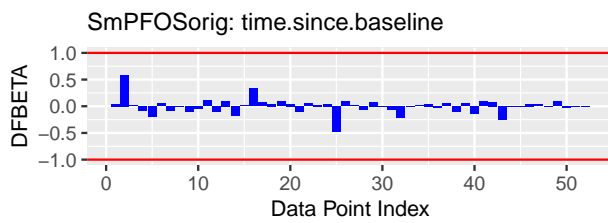
Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib

Cook's Distance with Cutoff at 50% Percentile of F(3, 49) Distrib



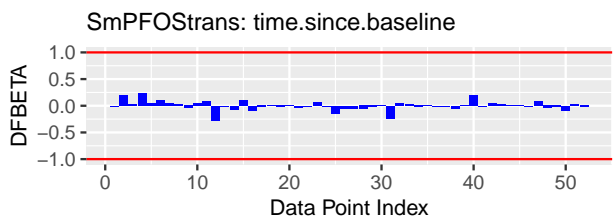
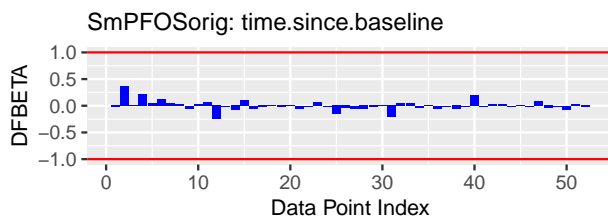
DFBETA Influence Measure on (Intercept) with Cutoff at 1

DFBETA Influence Measure on (Intercept) with Cutoff at 1



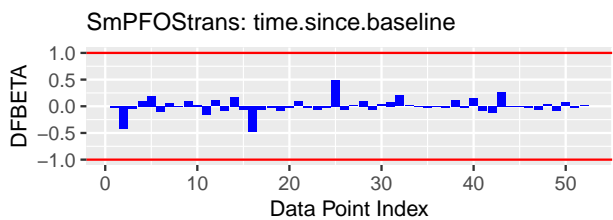
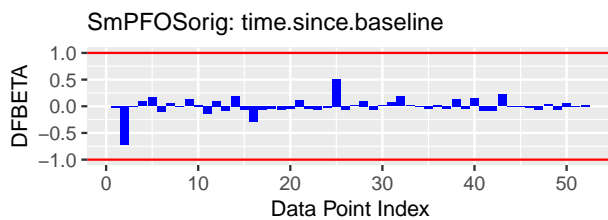
DFBETA Influence Measure on EthnicityHispanic with Cutoff at 1

DFBETA Influence Measure on EthnicityHispanic with Cutoff at 1



DFBETA Influence Measure on time.since.baseline with Cutoff at 1

DFBETA Influence Measure on time.since.baseline with Cutoff at 1



add CD plots and DFBETA plots to forloop above to keep all relevant mdl together interpret results Write function for sensitivity analyses

```
for (i in 1:length(pfas.list)) {
  pfas.name <- pfas.list[i]
  Tpfas.name <- pfastrans.list[i]
  for (fire.var in fire.list) {
    out_info <- change_plot_fxn(FireChange2, pfas.name, Tpfas.name, fire.var)

    #Cooks distance plots
    CDplots <- sapply(list(out_info$pfasm1, out_info$transmdl), cooks_distance_plot)
    print(ggarrange(plotlist = CDplots) +
      labs(title = paste0(out_info$transmdl$terms[[2]], ": ",
        out_info$pfasm1$terms[[3]][2]))
  }
}

for (i in 1:length(pfas.list)) {
  pfas.name <- pfas.list[i]
  Tpfas.name <- pfastrans.list[i]
  for (fire.var in fire.list) {
    out_info <- change_plot_fxn(FireChange2, pfas.name, Tpfas.name, fire.var)

    #DFBETA plots
    fbeta1 <- fbetas_plot(out_info$pfasm1, paste0(out_info$pfasm1$terms[[2]], ": ",
      out_info$pfasm1$terms[[3]][2]))
    fbeta2 <- fbetas_plot(out_info$transmdl, paste0(out_info$transmdl$terms[[2]], ": ",
      out_info$transmdl$terms[[3]][2]))
    FBplots <- list(fbeta1$(Intercept)$plot, fbeta1$total.num.fireruns$plot,
      fbeta1$EthnicityHispanic$plot, fbeta2$(Intercept)$plot,
      fbeta2$total.num.fireruns$plot, fbeta2$EthnicityHispanic$plot)
    print(ggarrange(plotlist = FBplots))

  }
}
}
```

For every change score models, get more diagnostic information (cooks distance, and dfbetas) for both original and transformed models: [https://cran.r-project.org/web/packages/olsrr/vignettes/influence\\_measures.html](https://cran.r-project.org/web/packages/olsrr/vignettes/influence_measures.html)

options: get rid of a point or two, or transform. would probably prefer to transform because we can leave the point in the model. Use ggarrange to condense the output a little

- Look through residuals.
- Get rid of age and bmi from change scores.
- Add in baseline pfas to each model as follow-up as sensitivity
- add each age & bmi as sensitivity
- Take women out. Done. still need to ask Dean about this.
- We have a month.
- I should look through Amy's incumbent vs. new recruit info.
- Make sure longitudinal models are done
- need to do dichotomous models
- Think about how to control for multiple comparisons