plot.glm

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This is a minimal example showing the diagnostic plots.

1 Effect of probability on the diagnostic statistics

This is shown in table 1.

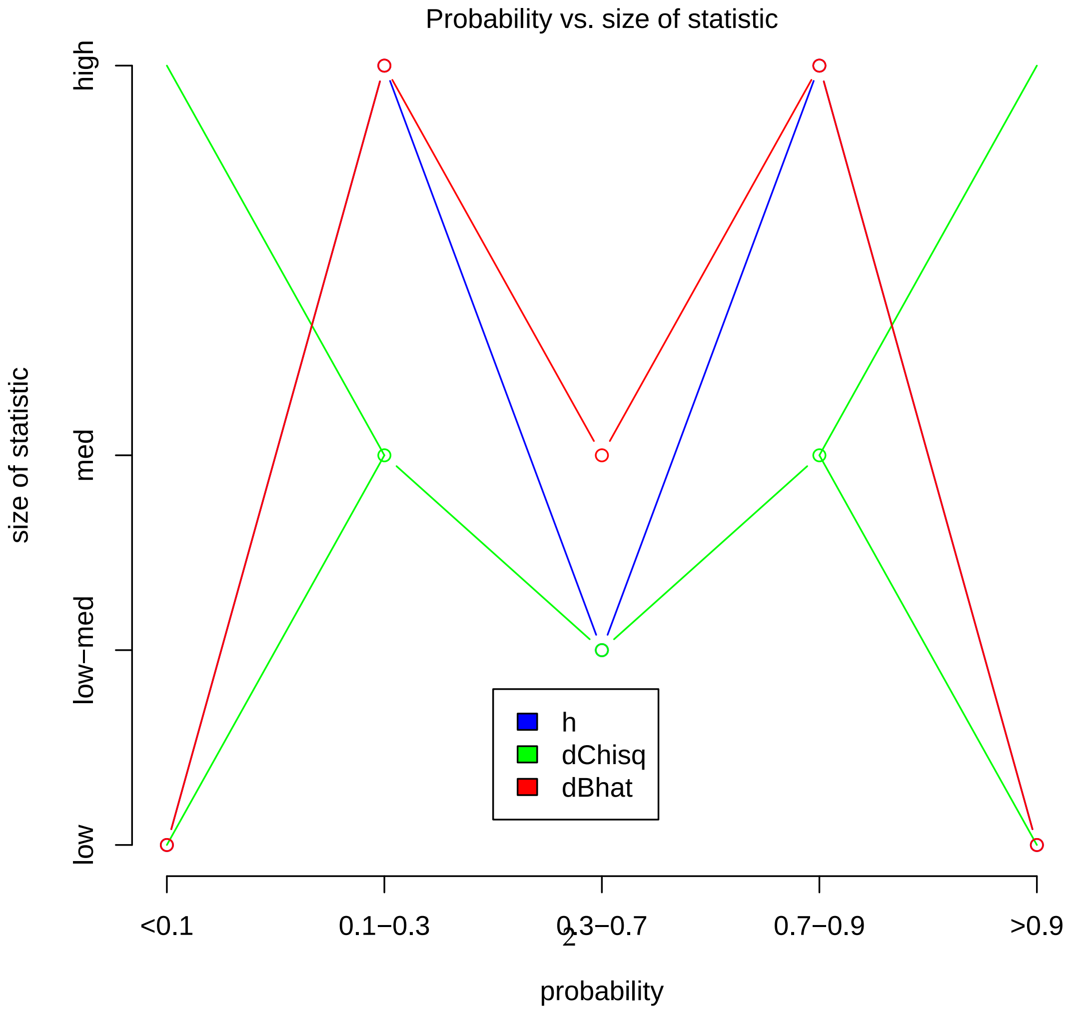
The relationship can be shown graphically as below:

```r
p <- seq(5)
h <- c(1, 3, 1.5, 3, 1)
plot(p, h, type="b",
     col="blue", axes=FALSE,
     xlab="probability",
     ylab="size of statistic")
axis(1, at=p, labels=c("<0.1", "0.1-0.3", "0.3-0.7", "0.7-0.9", ">0.9"))
axis(2, at=c(1, 1.5, 2, 3), labels=c("low", "low-med", "med", "high"))
dChisq <- c(2, 1.5, 2)
points(c(2, 3, 4), dChisq, type="b", col="green")
lines(x=c(1, 2), y=c(3, 2), col="green")
lines(x=c(1, 2), y=c(1, 2),col="green")
lines(x=c(4, 5), y=c(2, 1), col="green")
lines(x=c(4, 5), y=c(2, 3),col="green")
dBhat <- c(1, 3, 2, 3, 1)
points(p, dBhat, type="b", col="red")
legend(2.5, y=1.4, legend=c("h", "dChisq", "dBhat"),
       fill=c("blue", "green", "red"))
mtext("Probability vs. size of statistic")
```

P	h	dχ^2	d$\hat{\beta}$
<0.1	l	l / h	l
0.1 - 0.3	h	m	h
0.3 - 0.7	l - m	l - m	m
0.7 - 0.9	h	m	h
>0.9	l	l/ h	l

Abbreviations:
l = low
l - m = low to medium
m = medium
l/ h = low or high
h = high

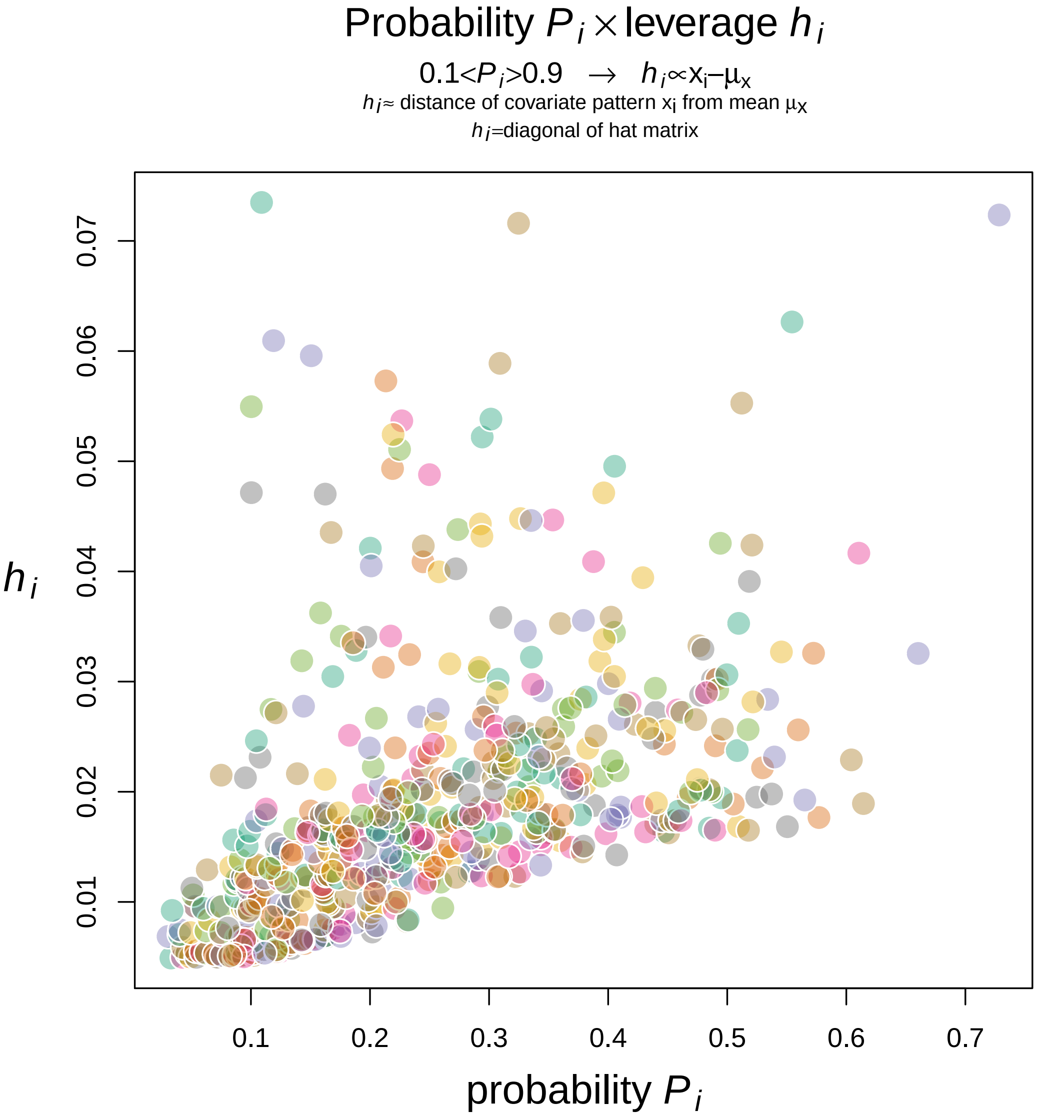
Table 1: Effect of probability on diagnostics

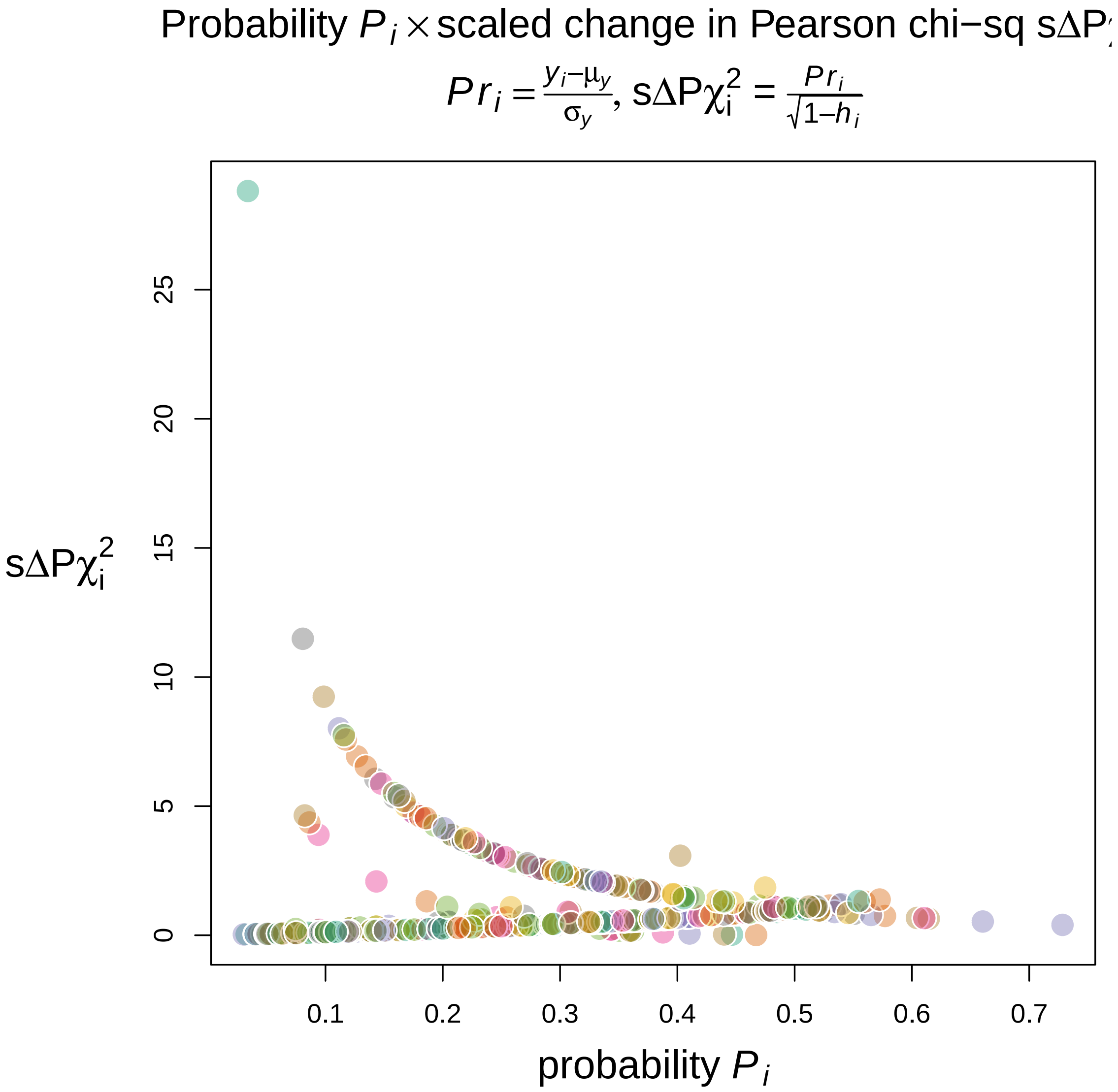


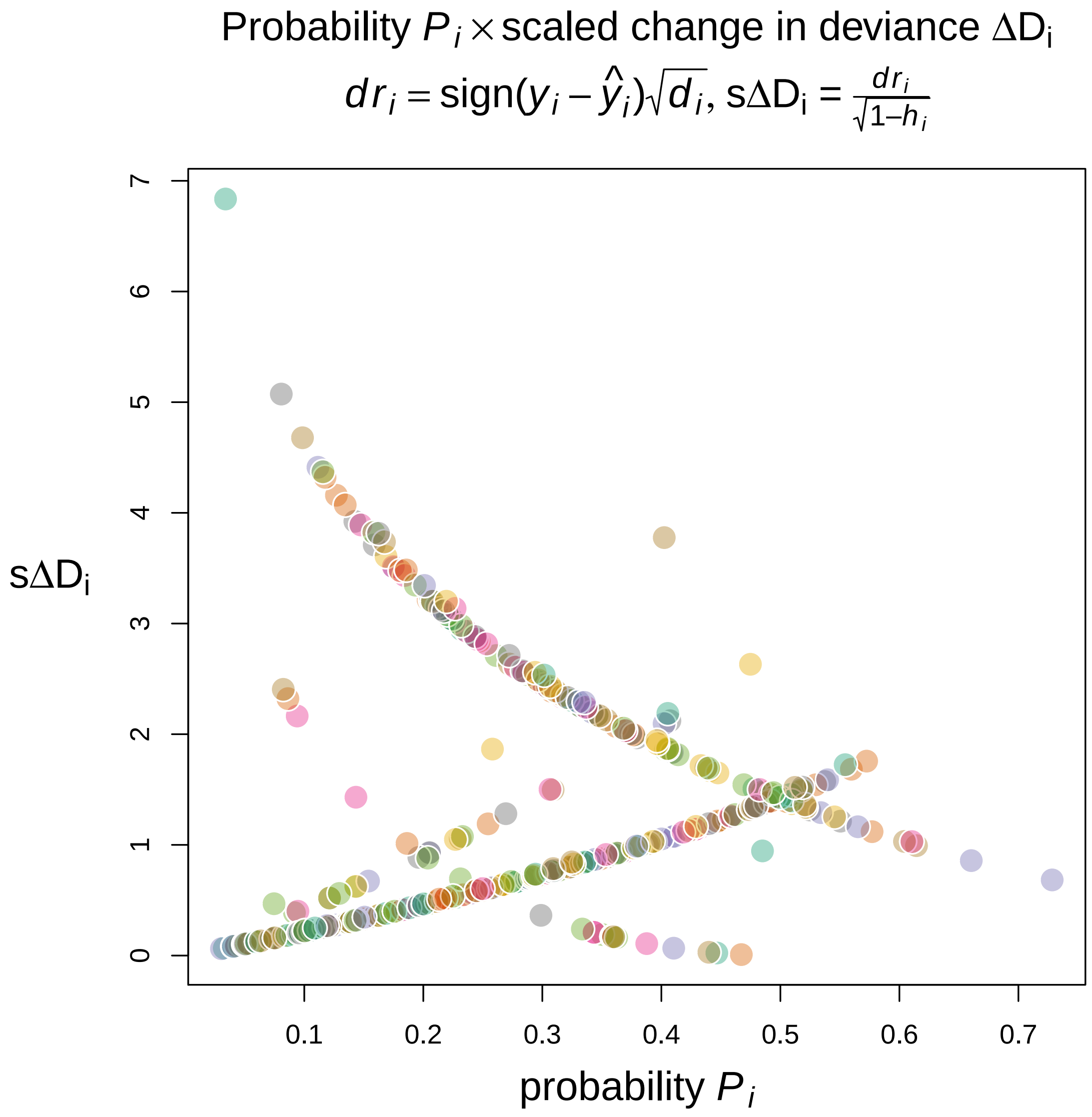
2 Sample graphical output from `plot.glm`

```
library("LogisticDx")
## H&L 2nd ed. Table 4.9. Figures 5.5-5.8. Pages 177-180.
data(uis)
uis <- within(uis, {
    NDRGFP1 <- 10 / (NDRGTX + 1)
    NDRGFP2 <- NDRGFP1 * log((NDRGFP1 + 1) / 10)
})
summary(g1 <- glm(DFREE ~ AGE + NDRGFP1 + NDRGFP2 + IVHX +
                  RACE + TREAT + SITE +
                  AGE:NDRGFP1 + RACE:SITE,
                  family=binomial, data=uis))

##
## Call:
## glm(formula = DFREE ~ AGE + NDRGFP1 + NDRGFP2 + IVHX + RACE +
##     TREAT + SITE + AGE:NDRGFP1 + RACE:SITE, family = binomial,
##     data = uis)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.3036  -0.7914  -0.5783   0.9902   2.6024
##
## Coefficients:
##                  Estimate Std. Error z value Pr(>|z|)
## (Intercept)     -6.607764   1.177521  -5.612 2.00e-08 ***
## AGE              0.116601   0.028859   4.040 5.34e-05 ***
## NDRGFP1          0.690191   0.209629   3.292 0.000993 ***
## NDRGFP2         -0.461492   0.123824  -3.727 0.000194 ***
## IVHXprevious    -0.633915   0.298774  -2.122 0.033862 *
## IVHXrecent      -0.705257   0.261631  -2.696 0.007026 **
## RACEother        0.686261   0.264195   2.598 0.009389 **
## TREATlong        0.433709   0.203791   2.128 0.033320 *
## SITEB            0.516694   0.254937   2.027 0.042688 *
## AGE:NDRGFP1     -0.015260   0.006026  -2.532 0.011329 *
## RACEother:SITEB -1.431087   0.529872  -2.701 0.006917 **
## ---
## Signif. codes:
## 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 653.73  on 574  degrees of freedom
## Residual deviance: 597.92  on 564  degrees of freedom
## AIC: 619.92
```

```
##
## Number of Fisher Scoring iterations: 4

plot(g1, devNew=FALSE)
```

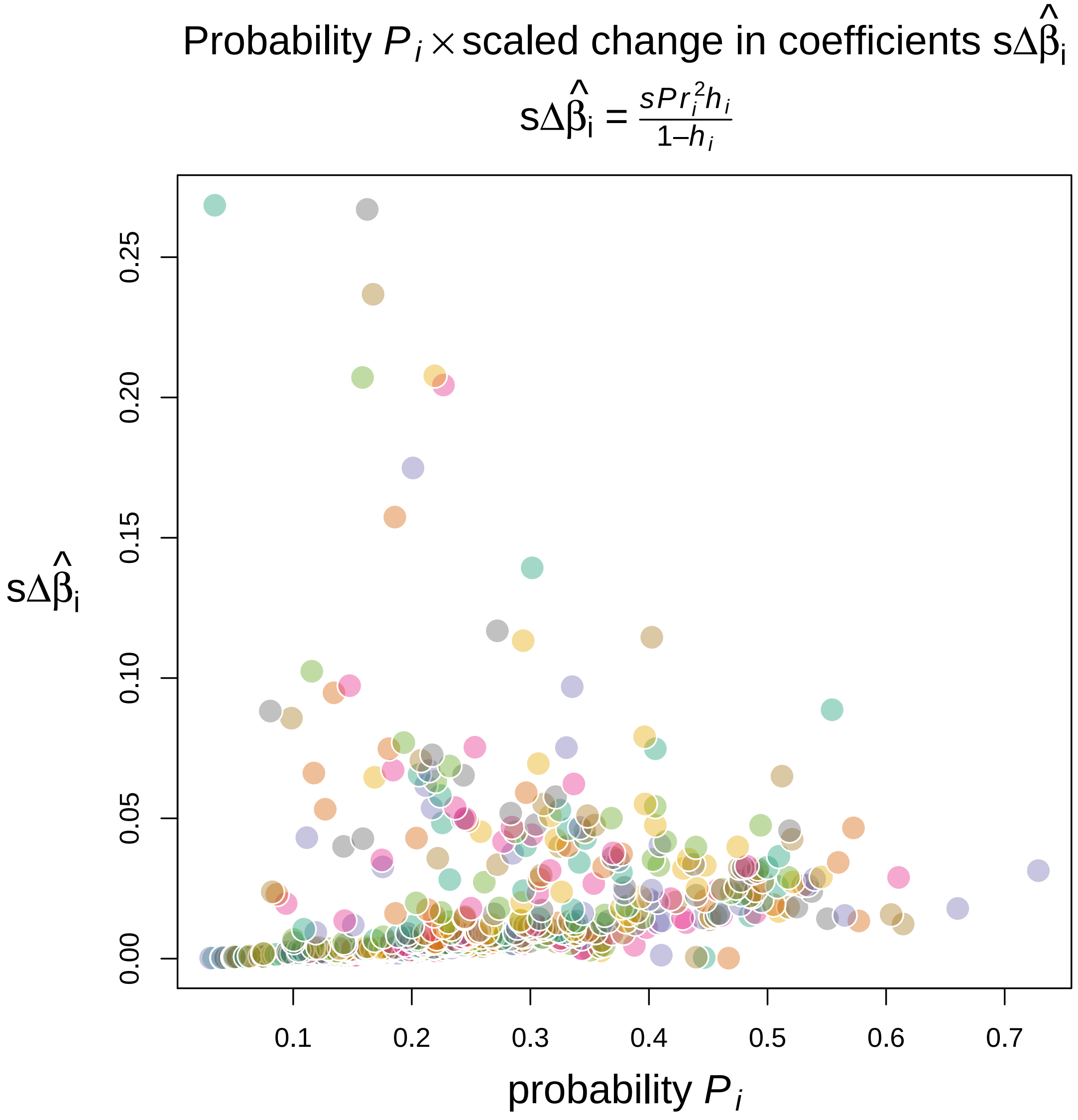


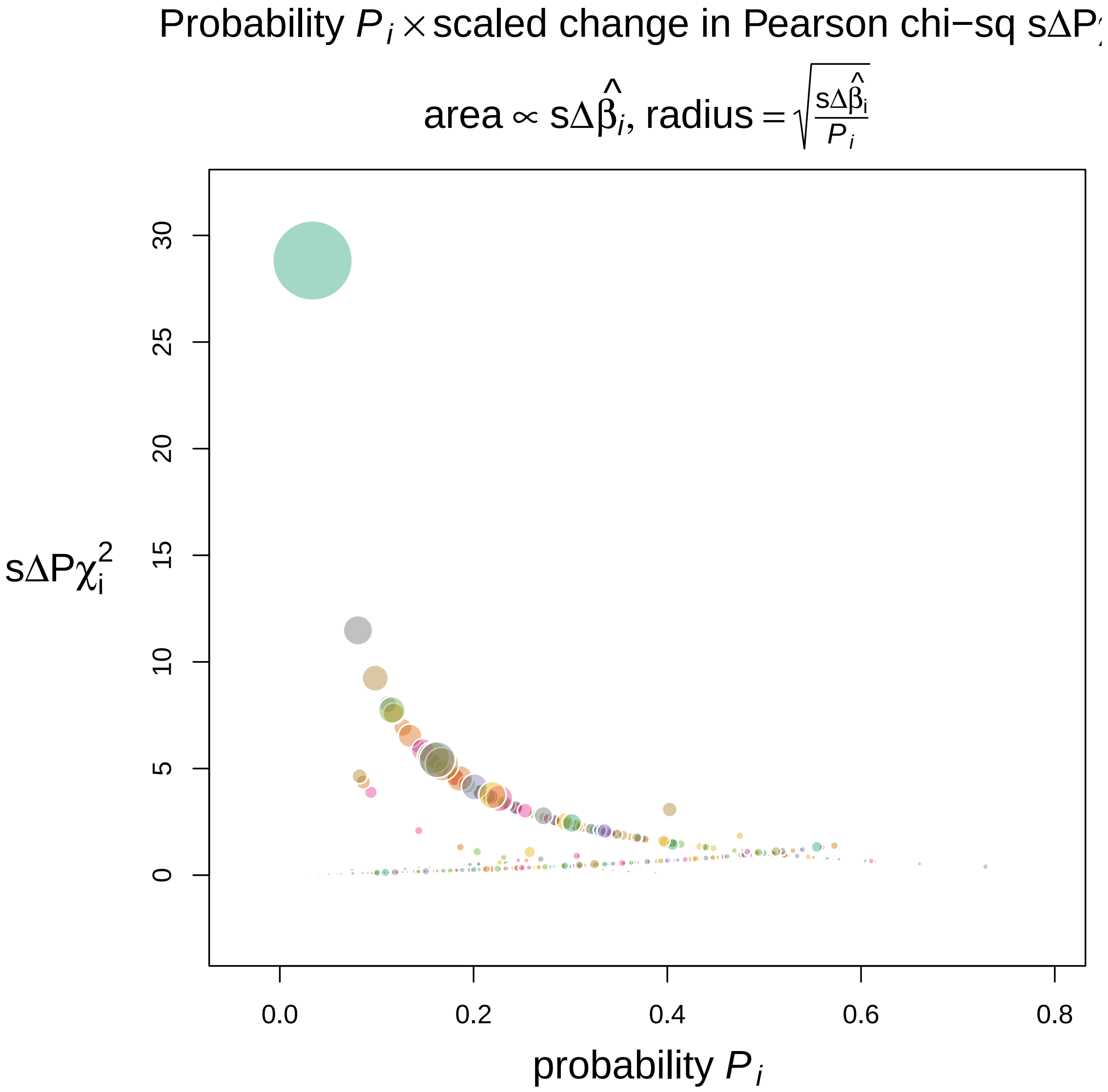

Probability $P_i \times$ scaled change in Pearson chi−sq sΔP
$Pr_i = \frac{y_i-\mu_y}{\sigma_y}$, $s\Delta P\chi^2_i = \frac{Pr_i}{\sqrt{1-h_i}}$
$s\Delta P\chi^2_i$
0
5
10
15
20
25
0.1
0.2
0.3
0.4
0.5
0.6
0.7
probability P_i



Probability $P_i \times$ scaled change in deviance ΔD_i

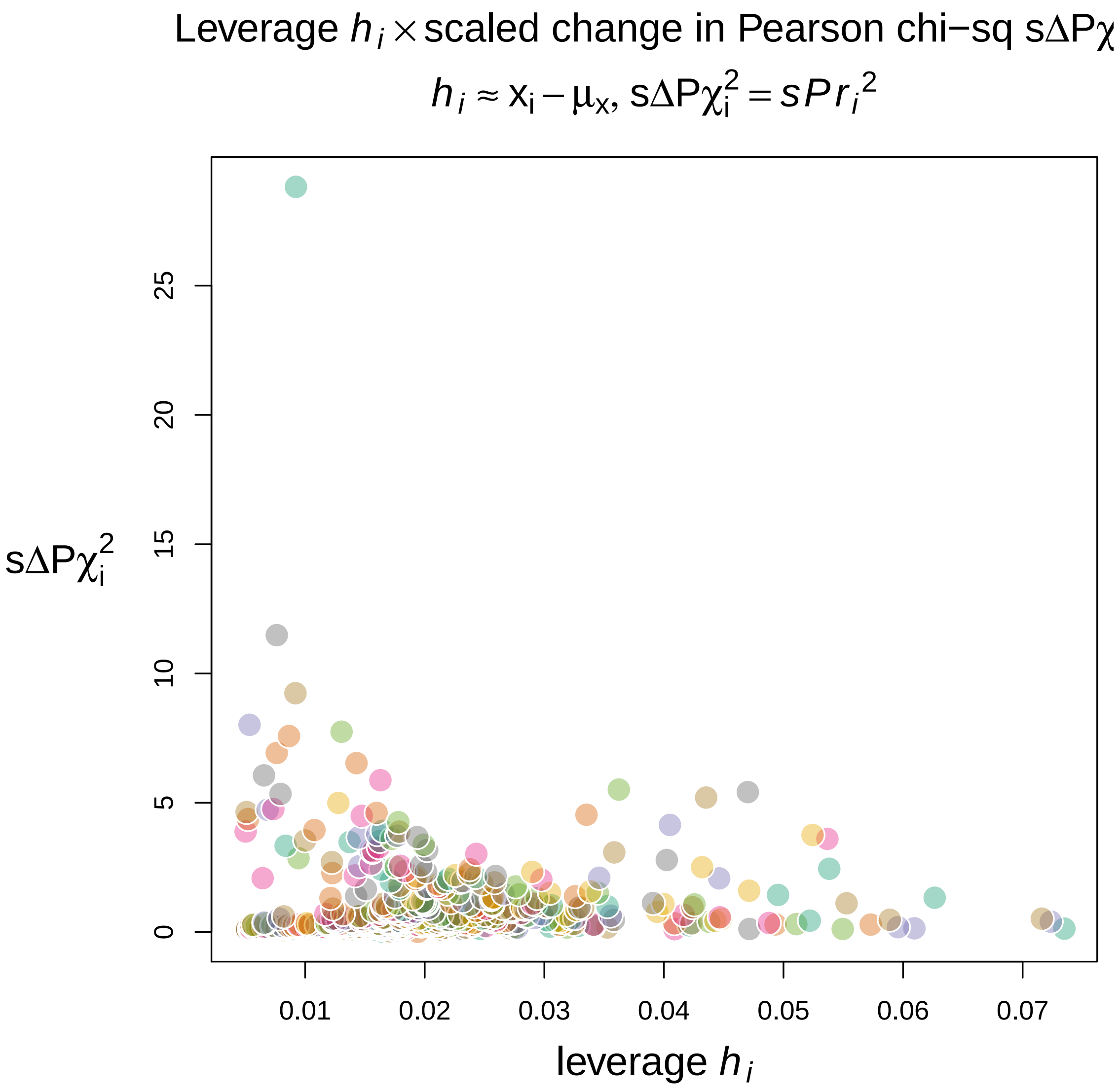
$dr_i = \text{sign}(y_i - \hat{y}_i)\sqrt{d_i}$, $s\Delta D_i = \frac{dr_i}{\sqrt{1-h_i}}$

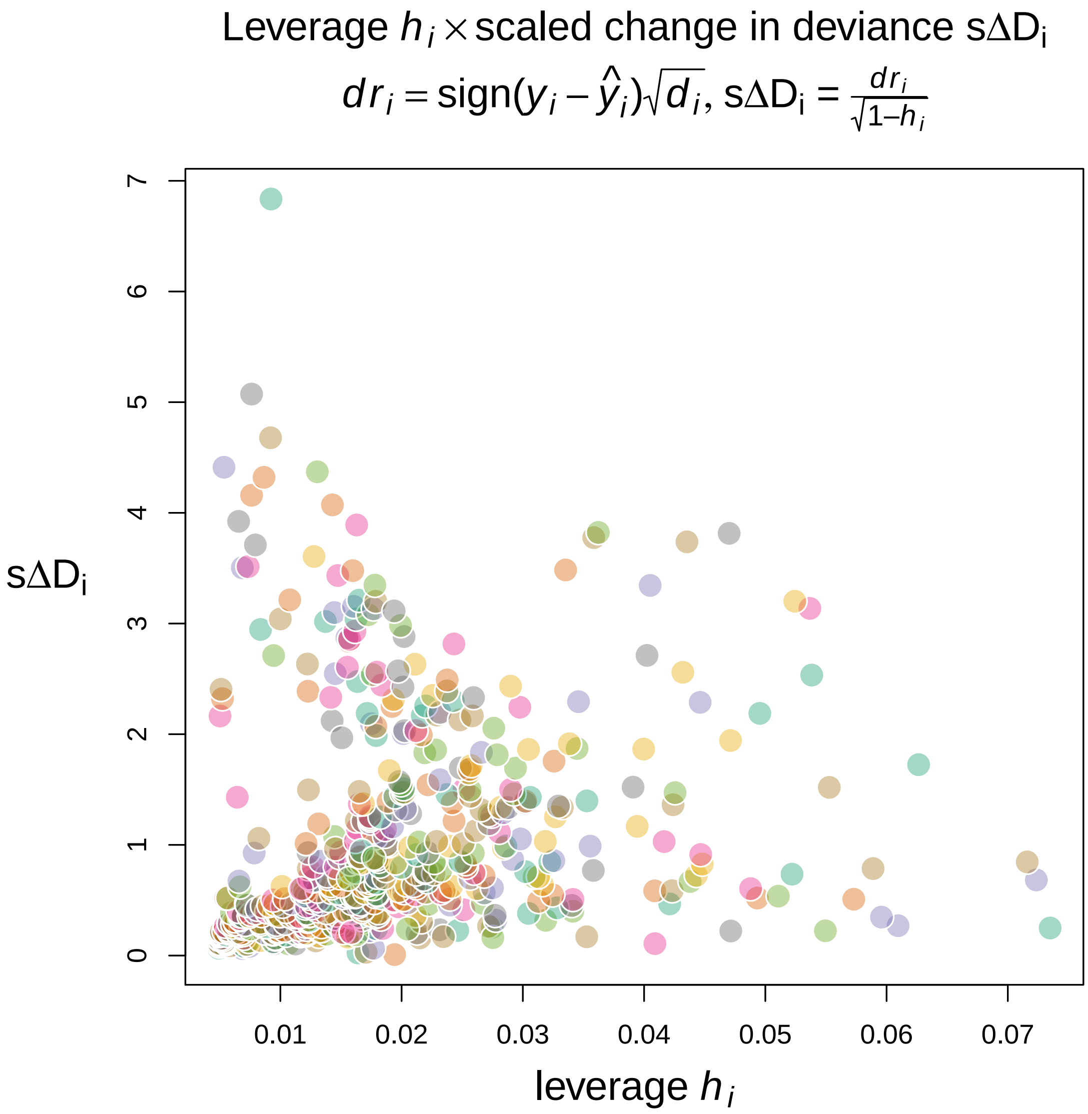

Probability $P_i \times$ scaled change in coefficients $s\Delta\hat{\beta}_i$
$s\Delta\hat{\beta}_i = \frac{sPr_i^2 h_i}{1-h_i}$
$s\Delta\hat{\beta}_i$
0.00
0.05
0.10
0.15
0.20
0.25
0.1
0.2
0.3
0.4
0.5
0.6
0.7
probability P_i

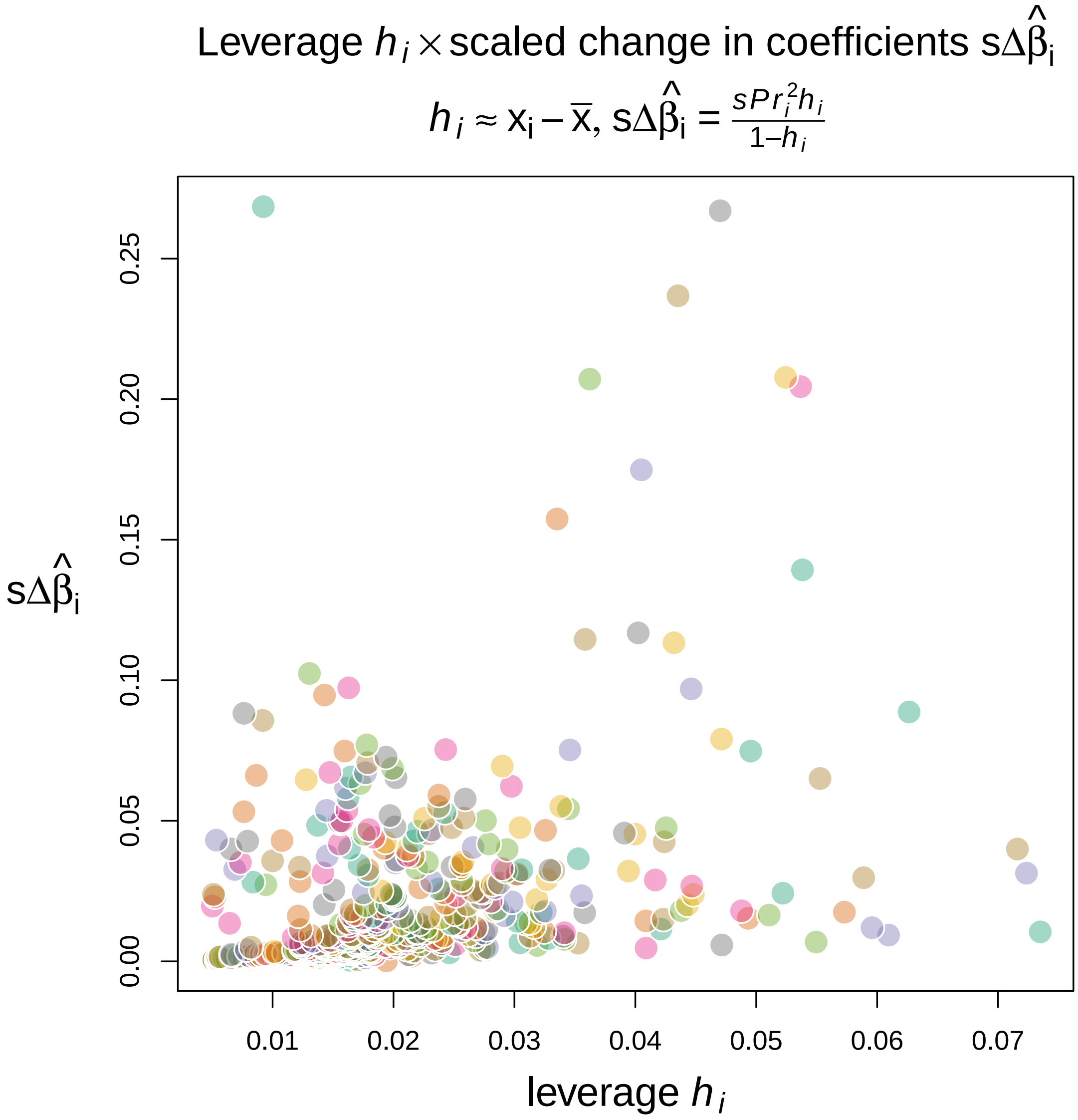


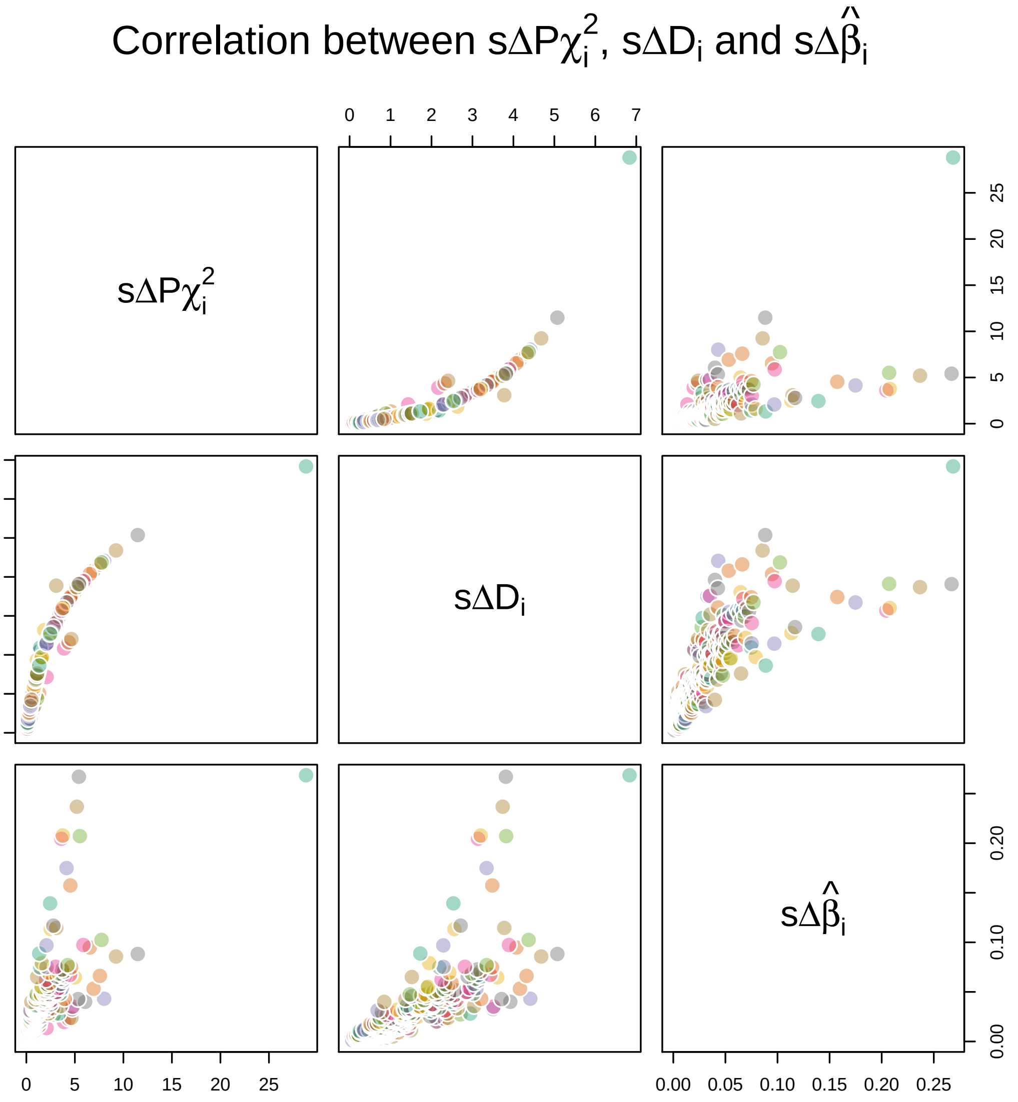
Probability $P_i \times$ scaled change in Pearson chi−sq sΔP

area $\propto s\Delta\hat{\beta}_i$, radius $= \sqrt{\frac{s\Delta\hat{\beta}_i}{P_i}}$


Leverage $h_i \times$ scaled change in Pearson chi−sq sΔPχ
$h_i \approx x_i - \mu_x$, $s\Delta P\chi_i^2 = sPr_i^2$
$s\Delta P\chi_i^2$
0
5
10
15
20
25
0.01
0.02
0.03
0.04
0.05
0.06
0.07
leverage h_i


Leverage $h_i \times$ scaled change in deviance $\mathrm{s\Delta D_i}$
$dr_i = \mathrm{sign}(y_i - \hat{y}_i)\sqrt{d_i}$, $\mathrm{s\Delta D_i} = \frac{dr_i}{\sqrt{1-h_i}}$
$\mathrm{s\Delta D_i}$
0
1
2
3
4
5
6
7
0.01
0.02
0.03
0.04
0.05
0.06
0.07
leverage h_i


Leverage $h_i \times$ scaled change in coefficients $s\Delta\hat{\beta}_i$
$h_i \approx x_i - \overline{x}$, $s\Delta\hat{\beta}_i = \frac{sPr_i^2 h_i}{1-h_i}$
$s\Delta\hat{\beta}_i$
0.00
0.05
0.10
0.15
0.20
0.25
0.01
0.02
0.03
0.04
0.05
0.06
0.07
leverage h_i



Correlation between $s\Delta P\chi^2_i$, $s\Delta D_i$ and $s\Delta\hat{\beta}_i$