Lung Cancer

Jose Tamez

2023-04-28

Contents

1 Detailed Survival analyis of the Survival lung data.

```
library(survival)
library(FRESA.CAD)
```

```
## Loading required package: Rcpp
```

```
## Loading required package: stringr
```

```
## Loading required package: miscTools
```

```
## Loading required package: Hmisc
```

```
##
## Attaching package: 'Hmisc'
```

```
## The following objects are masked from 'package:base':
##
##     format.pval, units
```

```
## Loading required package: pROC
```

```
## Type 'citation("pROC")' for a citation.
```

```
##
## Attaching package: 'pROC'
```

```
## The following objects are masked from 'package:stats':
##
##     cov, smooth, var
```

```
op <- par(no.readonly = TRUE)
pander::panderOptions('digits', 3)
pander::panderOptions('keep.trailing.zeros',TRUE)
```

```
data(lung)
```

```
## Warning in data(lung): data set 'lung' not found
```

```
lung$inst <- NULL
lung$status <- lung$status - 1
lung <- lung[complete.cases(lung),]

pander::pander(table(lung$status))
```

0	1
47	121

```
pander::pander(summary(lung$time))
```

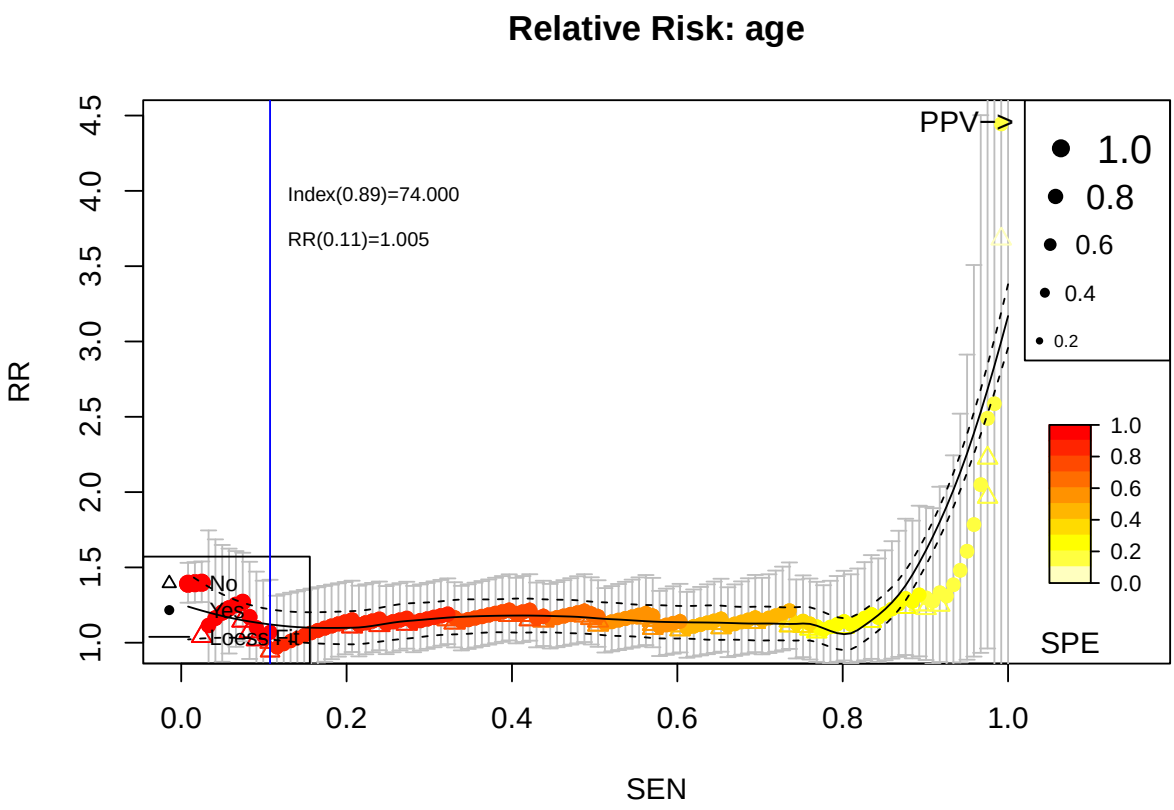
Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
5	175	268	310	416	1022

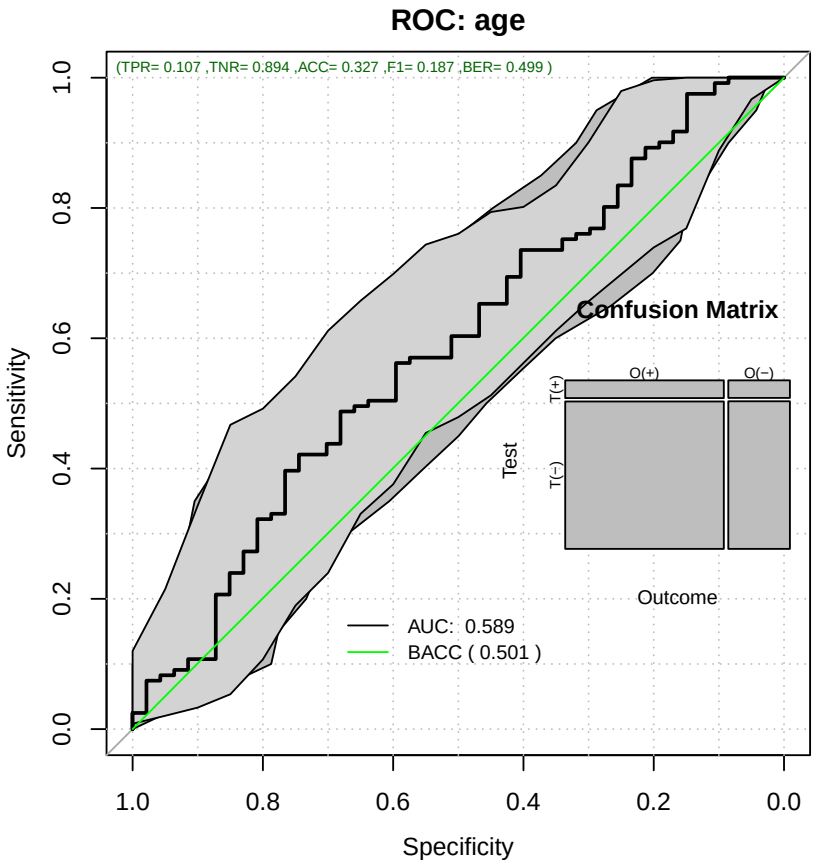
1.1 Exploring Raw Features with RRPlot

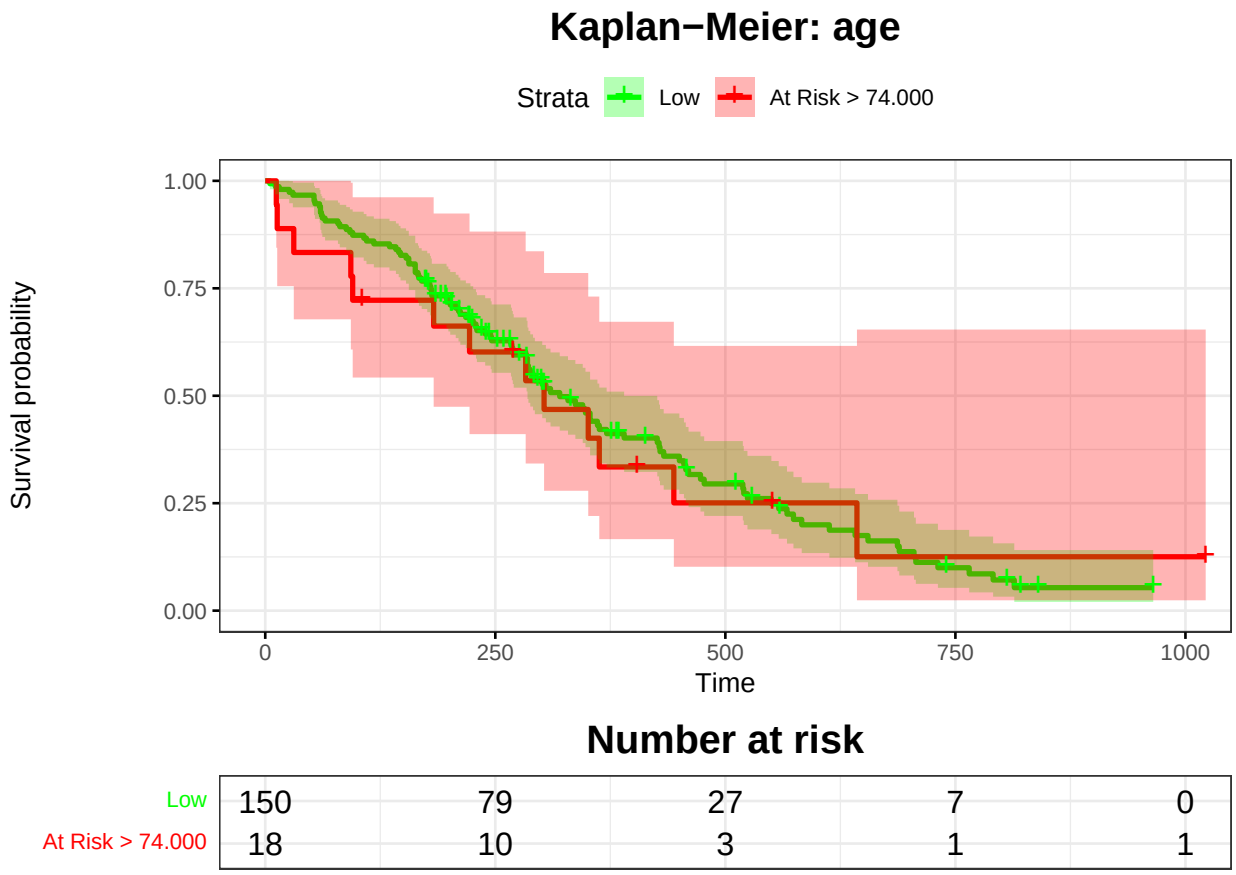
```
convar <- colnames(lung)[lapply(apply(lung,2,unique),length) > 10]
convar <- convar[convar != "time"]
topvar <- univariate_BinEnsemble(lung[,c("status",convar)],"status")
pander::pander(topvar)
```

age	wt.loss
0.106	0.106

```
topv <- min(5,length(topvar))
topFive <- names(topvar)[1:topv]
RRanalysis <- list();
idx <- 1
for (topf in topFive)
{
  RRanalysis[[idx]] <- RRPlot(cbind(lung$status,lung[,topf]),
                              atProb=c(0.90),
                  timetoEvent=lung$time,
                  title=topf,
#                   plotRR=FALSE
                  )
  idx <- idx + 1
}
```

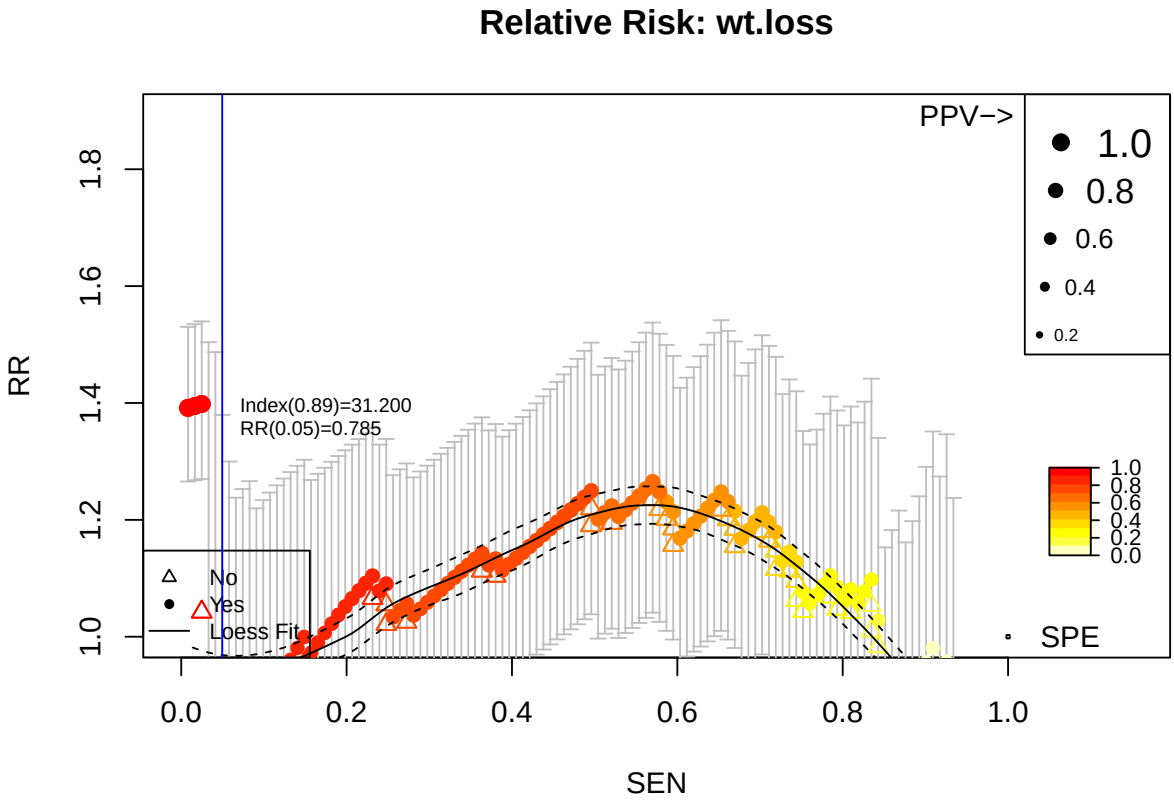

Relative Risk: age
RR
SEN
PPV->
SPE
Index(0.89)=74.000
RR(0.11)=1.005
No
Yes
Loess Fit
1.0
0.8
0.6
0.4
0.2
0.0
1.0
2.0
2.5
3.0
3.5
4.0
4.5
0.0
0.2
0.4
0.6
0.8
1.0

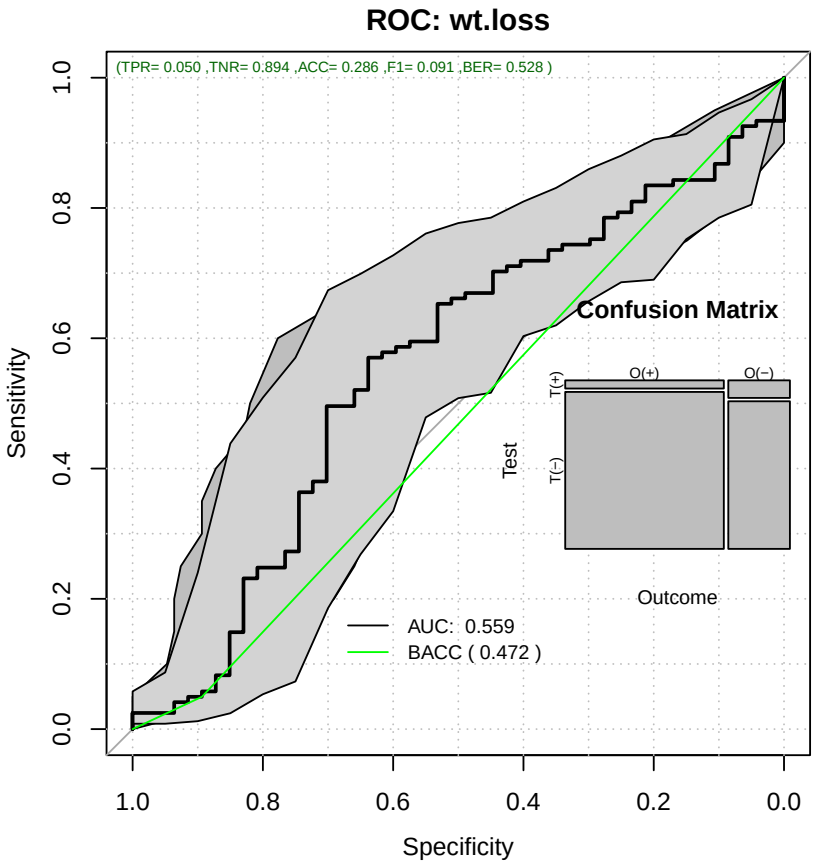

ROC: age
(TPR= 0.107 ,TNR= 0.894 ,ACC= 0.327 ,F1= 0.187 ,BER= 0.499)
Sensitivity
Specificity
1.0
0.8
0.6
0.4
0.2
0.0
Confusion Matrix
O(+)
O(−)
T(+)
T(−)
Test
Outcome
AUC: 0.589
BACC (0.501)

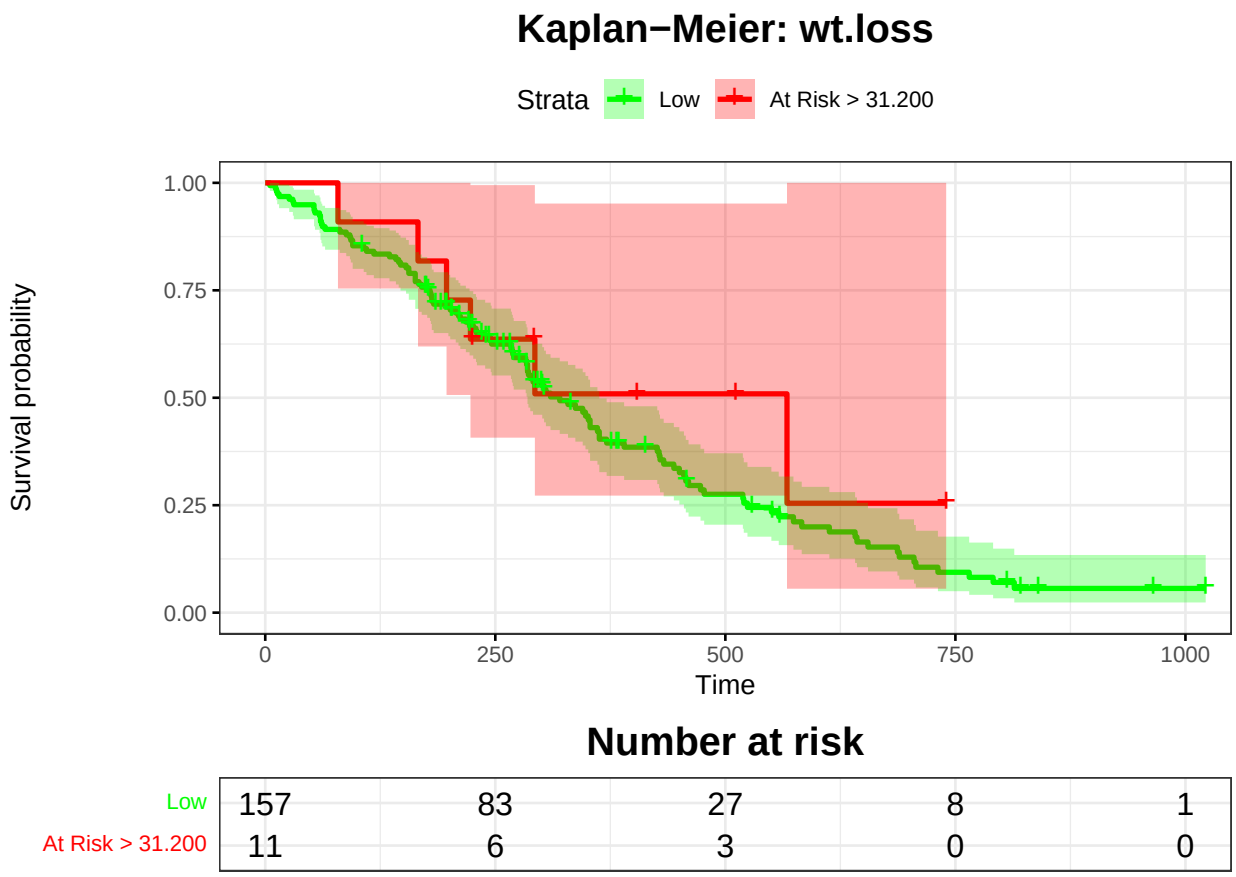


Number at risk

Low	150	79	27	7	0
At Risk > 74.000	18	10	3	1	1


Relative Risk: wt.loss
PPV–>
1.0
0.8
0.6
0.4
0.2
Index(0.89)=31.200
RR(0.05)=0.785
1.0
0.8
0.6
0.4
0.2
0.0
No
Yes
Loess Fit
SPE
RR
1.0
1.2
1.4
1.6
1.8
0.0
0.2
0.4
0.6
0.8
1.0
SEN


ROC: wt.loss
(TPR= 0.050 ,TNR= 0.894 ,ACC= 0.286 ,F1= 0.091 ,BER= 0.528)
Sensitivity
Specificity
1.0
0.8
0.6
0.4
0.2
0.0
Confusion Matrix
O(+)
O(−)
T(+)
T(−)
Test
Outcome
AUC: 0.559
BACC (0.472)




```
names(RRanalysis) <- topFive
```

1.2 Reporting the Metrics

```
ROCAUC <- NULL
CstatCI <- NULL
RRatios <- NULL
LogRangp <- NULL
Sensitivity <- NULL
Specificity <- NULL

for (topf in topFive)
{
  CstatCI <- rbind(CstatCI,RRanalysis[[topf]]$c.index$cstatCI)
  RRatios <- rbind(RRatios,RRanalysis[[topf]]$RR_atP)
  LogRangp <- rbind(LogRangp,RRanalysis[[topf]]$surdif$pvalue)
  Sensitivity <- rbind(Sensitivity,RRanalysis[[topf]]$ROCAnalysis$sensitivity)
  Specificity <- rbind(Specificity,RRanalysis[[topf]]$ROCAnalysis$specificity)
  ROCAUC <- rbind(ROCAUC,RRanalysis[[topf]]$ROCAnalysis$aucs)
}
rownames(CstatCI) <- topFive
rownames(RRatios) <- topFive
rownames(LogRangp) <- topFive
rownames(Sensitivity) <- topFive
rownames(Specificity) <- topFive
```

```
rownames(ROCAUC) <- topFive

pander::pander(ROCAUC)
```

	est	lower	upper
age	0.589	0.491	0.686
wt.loss	0.559	0.460	0.658

```
pander::pander(CstatCI)
```

	mean.C Index	median	lower	upper
age	0.558	0.557	0.494	0.618
wt.loss	0.513	0.513	0.449	0.570

```
pander::pander(RRatios)
```

	est	lower	upper
age	1.005	0.744	1.36
wt.loss	0.785	0.462	1.33

```
pander::pander(LogRangp)
```

age	0.859
wt.loss	0.358

```
pander::pander(Sensitivity)
```

	est	lower	upper
age	0.1074	0.0585	0.177
wt.loss	0.0496	0.0184	0.105

```
pander::pander(Specificity)
```

	est	lower	upper
age	0.894	0.769	0.965
wt.loss	0.894	0.769	0.965

```
meanMatrix <- cbind(ROCAUC[,1],CstatCI[,1],Sensitivity[,1],Specificity[,1],RRatios[,1])
colnames(meanMatrix) <- c("ROCAUC","C-Stat","Sen","Spe","RR")
pander::pander(meanMatrix)
```

	ROCAUC	C-Stat	Sen	Spe	RR
age	0.589	0.558	0.1074	0.894	1.005

	ROCAUC	C-Stat	Sen	Spe	RR
wt.loss	0.559	0.513	0.0496	0.894	0.785

1.3 Modeling

```
ml <- BSWiMS.model(Surv(time,status)~1,data=lung,NumberofRepeats = 10)
```

[++++++++++++++++++++++++++++++]..

```
sm <- summary(ml)
pander::pander(sm$coefficients)
```

Table 11: Table continues below

	Estimate	lower	HR	upper	u.Accuracy	r.Accuracy
ph.ecog	4.32e-01	1.194	1.541	1.988	0.679	0.649
sex	-4.59e-01	0.456	0.632	0.876	0.649	0.679
pat.karno	-1.77e-03	0.997	0.998	1.000	0.506	0.720
ph.karno	-4.64e-07	1.000	1.000	1.000	0.577	0.720
age	4.57e-08	1.000	1.000	1.000	0.565	0.720

Table 12: Table continues below

	full.Accuracy	u.AUC	r.AUC	full.AUC	IDI	NRI
ph.ecog	0.601	0.601	0.620	0.600	0.0449	0.405
sex	0.601	0.620	0.601	0.600	0.0285	0.478
pat.karno	0.506	0.585	0.500	0.585	0.0292	0.342
ph.karno	0.577	0.570	0.500	0.570	0.0143	0.280
age	0.565	0.549	0.500	0.549	0.0162	0.195

	z.IDI	z.NRI	Delta.AUC	Frequency
ph.ecog	3.33	2.48	-0.02005	1.0
sex	2.76	2.85	-0.00167	1.0
pat.karno	2.44	2.24	0.08546	1.0
ph.karno	2.22	1.64	0.06998	0.8
age	1.97	1.14	0.04871	0.1

1.4 Cox Model Performance

Here we evaluate the model using the RRPlot() function.

1.4.1 The evaluation of the raw Cox model with RRPlot()

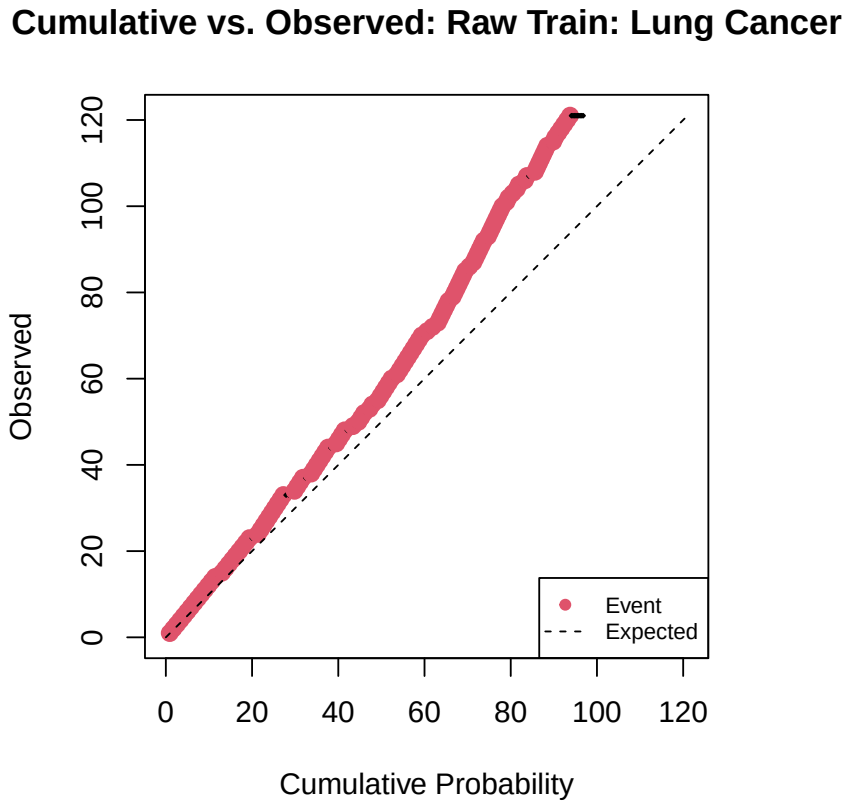
Here we will use the predicted event probability assuming a baseline hazard for events withing 5 years

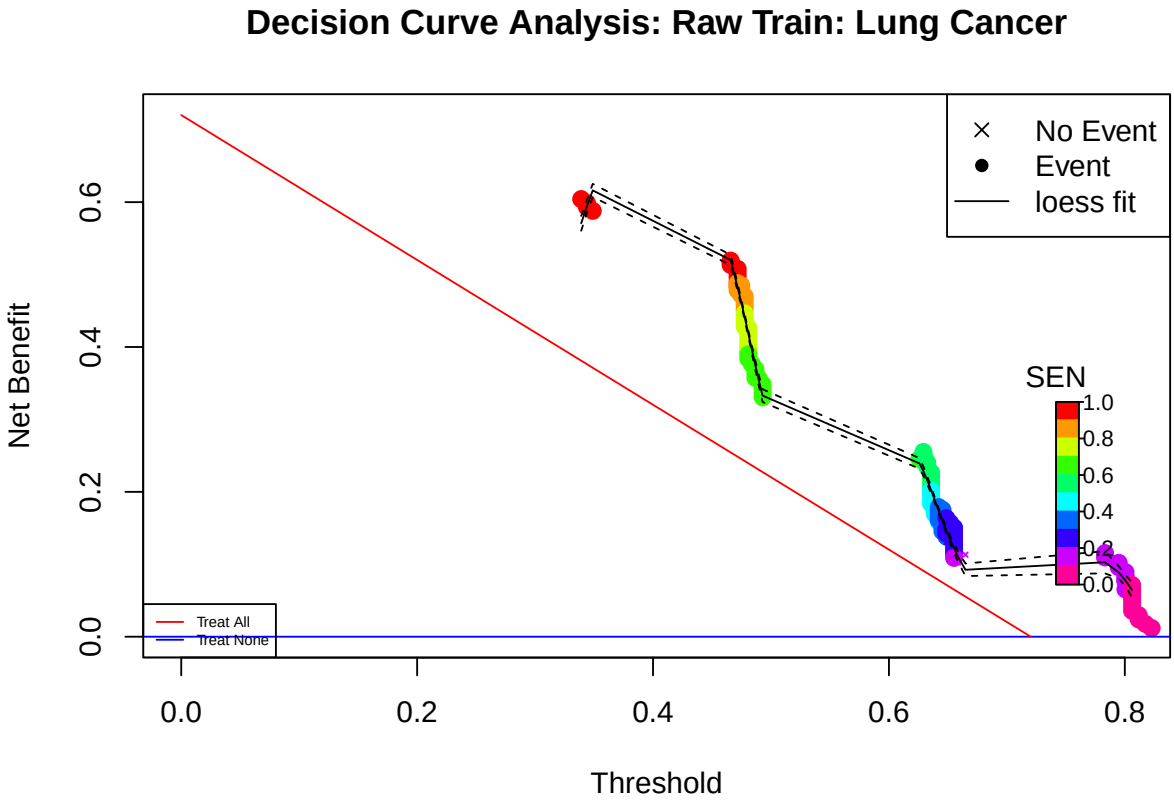
```
timeinterval <- 2*mean(subset(lung,status==1)$time)

h0 <- sum(lung$status & lung$time <= timeinterval)
h0 <- h0/sum((lung$time > timeinterval) | (lung$status==1))
pander::pander(t(c(h0=h0,timeinterval=timeinterval)),caption="Initial Parameters")
```

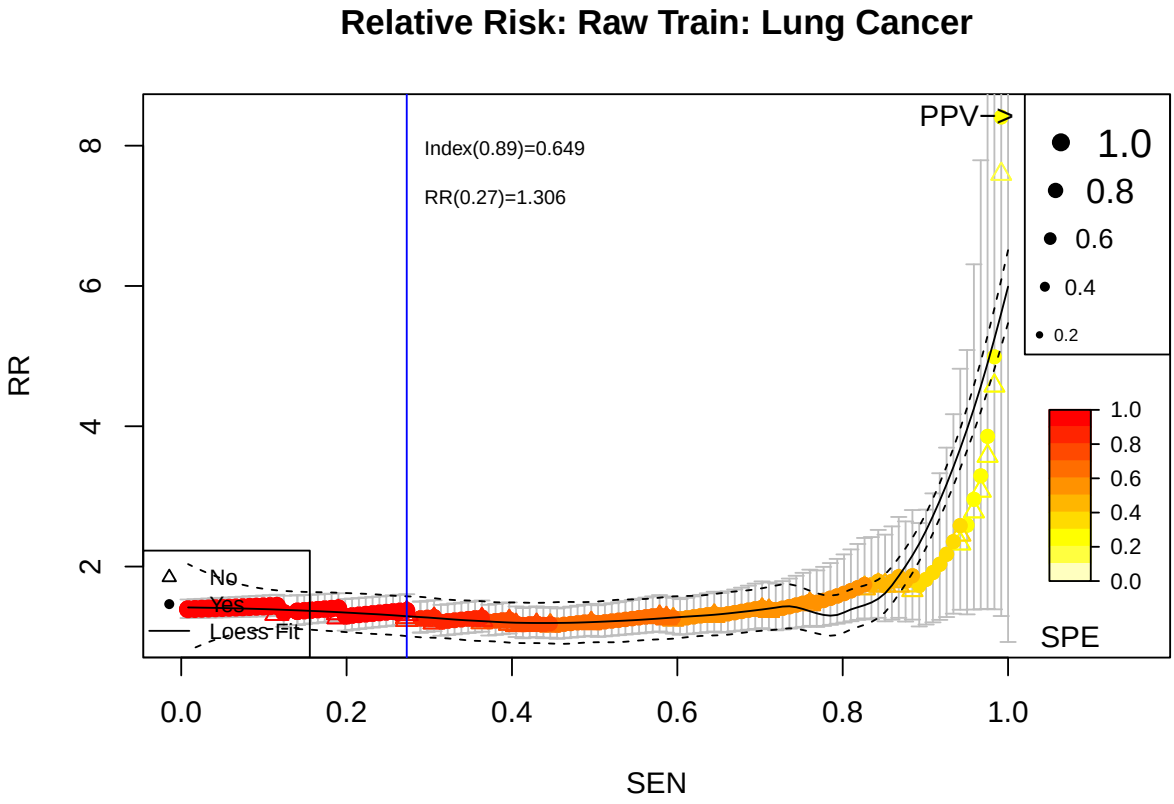
Table 14: Initial Parameters

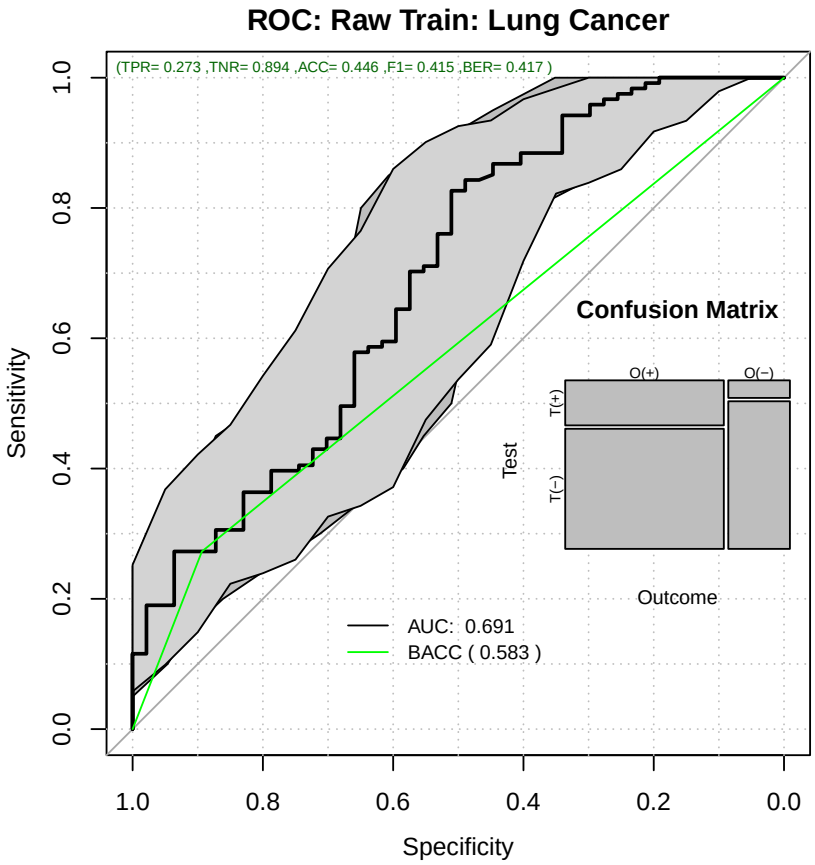
h0	timeinterval
0.85	578

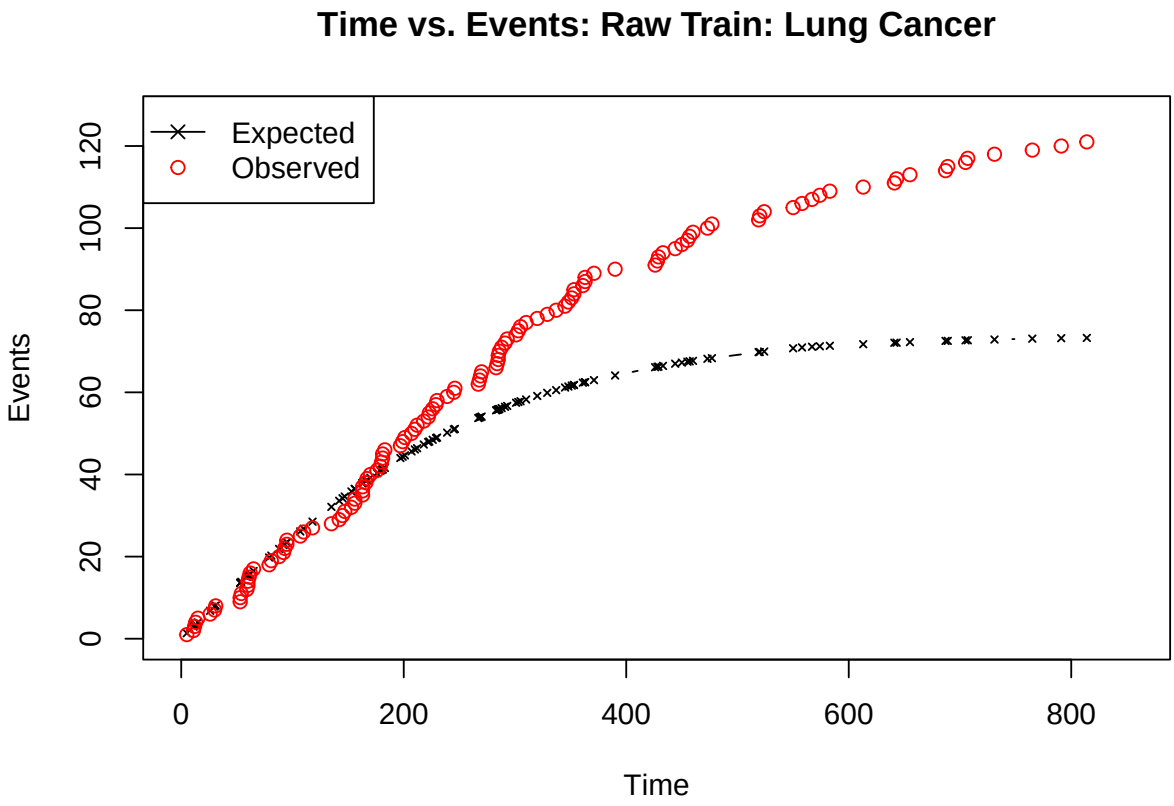
```
index <- predict(ml,lung)

rdata <- cbind(lung$status,ppoisGzero(index,h0))

rrAnalysisTrain <- RRPlot(rdata,atProb=c(0.90),
                      timetoEvent=lung$time,
                      title="Raw Train: Lung Cancer",
                      ysurvlim=c(0.00,1.0),
                      riskTimeInterval=timeinterval)
```

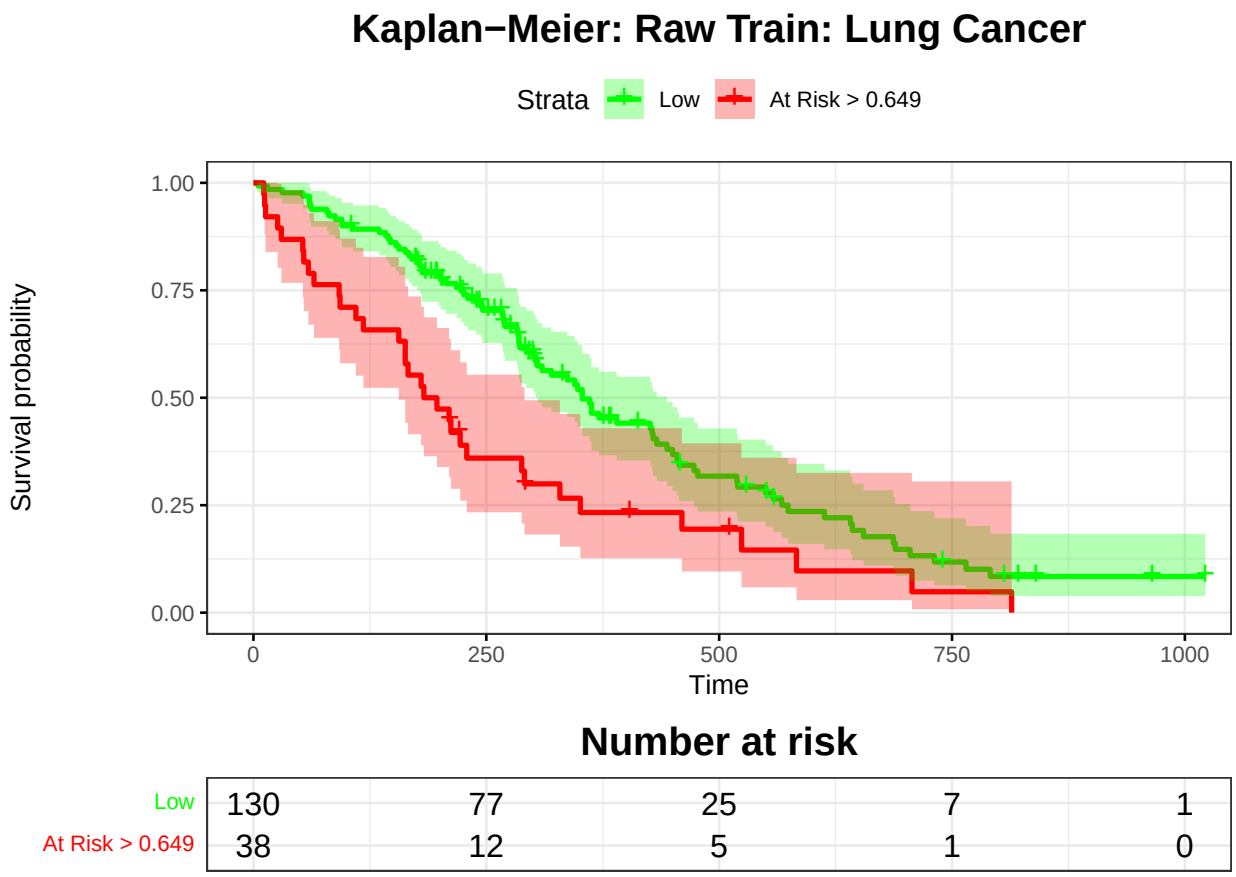



Decision Curve Analysis: Raw Train: Lung Cancer
No Event
Event
loess fit
SEN
1.0
0.8
0.6
0.4
0.2
0.0
Treat All
Treat None
Net Benefit
0.0
0.2
0.4
0.6
0.0
0.2
0.4
0.6
0.8
Threshold


Relative Risk: Raw Train: Lung Cancer
Index(0.89)=0.649
RR(0.27)=1.306
PPV
1.0
0.8
0.6
0.4
0.2
SPE
No
Yes
Loess Fit
RR
SEN
2
4
6
8
0.0
0.2
0.4
0.6
0.8
1.0


ROC: Raw Train: Lung Cancer
(TPR= 0.273 ,TNR= 0.894 ,ACC= 0.446 ,F1= 0.415 ,BER= 0.417)
Sensitivity
1.0
0.8
0.6
0.4
0.2
0.0
Specificity
1.0
0.8
0.6
0.4
0.2
0.0
Confusion Matrix
O(+)
O(−)
T(+)
T(−)
Test
Outcome
AUC: 0.691
BACC (0.583)


Time vs. Events: Raw Train: Lung Cancer
Expected
Observed
Events
0
20
40
60
80
100
120
0
200
400
600
800
Time



As we can see the Observed probability as well as the Time vs. Events are not calibrated.

1.4.2 Uncalibrated Performance Report

```
pander::pander(t(rrAnalysisTrain$OERatio),caption="O/E Ratio")
```

Table 15: O/E Ratio

est	lower	upper
1.65	1.37	1.97

```
pander::pander(t(rrAnalysisTrain$OE95ci),caption="O/E Ratio")
```

Table 16: O/E Ratio

mean	50%	2.5%	97.5%
1.21	1.21	1.16	1.25

```
pander::pander(t(rrAnalysisTrain$OAcum95ci),caption="O/Acum Ratio")
```

Table 17: O/Acum Ratio

mean	50%	2.5%	97.5%
1.2	1.2	1.19	1.21

```
pander::pander(rrAnalysisTrain$c.index$cstatCI,caption="C. Index")
```

mean.C Index	median	lower	upper
0.651	0.651	0.586	0.714

```
pander::pander(t(rrAnalysisTrain$ROCAnalysis$aucs),caption="ROC AUC")
```

Table 19: ROC AUC

est	lower	upper
0.691	0.598	0.784

```
pander::pander((rrAnalysisTrain$ROCAnalysis$sensitivity),caption="Sensitivity")
```

Table 20: Sensitivity

est	lower	upper
0.273	0.196	0.361

```
pander::pander((rrAnalysisTrain$ROCAnalysis$specificity),caption="Specificity")
```

Table 21: Specificity

est	lower	upper
0.894	0.769	0.965

```
pander::pander(t(rrAnalysisTrain$thr_atP),caption="Probability Thresholds")
```

Table 22: Probability Thresholds

90%
0.649

```
pander::pander(t(rrAnalysisTrain$RR_atP),caption="Risk Ratio")
```

Table 23: Risk Ratio

est	lower	upper
1.31	1.11	1.54

```
pander::pander(rrAnalysisTrain$surdif,caption="Logrank test")
```

Table 24: Logrank test Chisq = 10.879375 on 1 degrees of freedom, p = 0.000972

	N	Observed	Expected	(O-E)^2/E	(O-E)^2/V
class=0	130	88	101.3	1.76	10.9
class=1	38	33	19.7	9.05	10.9

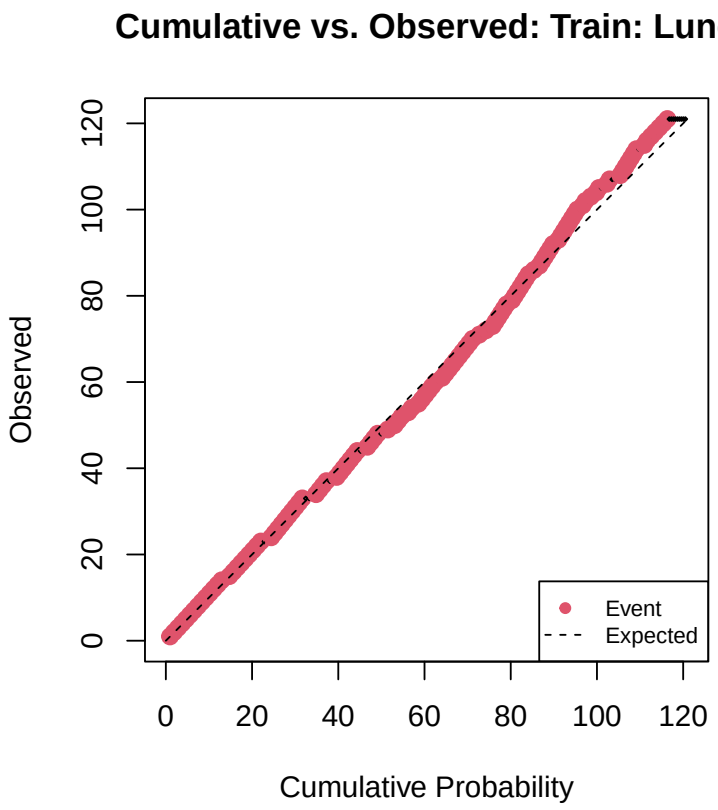
1.4.3 Cox Calibration

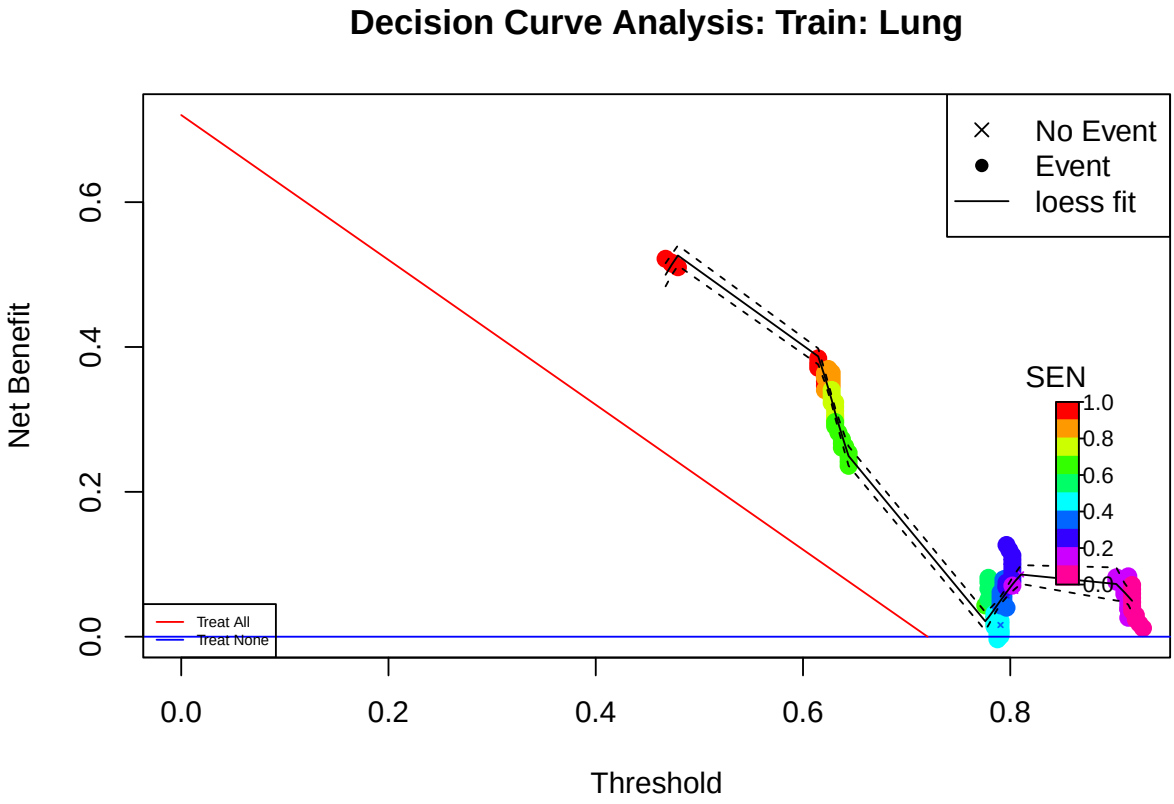
```
op <- par(no.readonly = TRUE)


calprob <- CoxRiskCalibration(ml,lung,"status","time")

pander::pander(c(h0=calprob$h0,
                 Gain=calprob$hazardGain,
                 DeltaTime=calprob$timeInterval),
               caption="Cox Calibration Parameters")
```

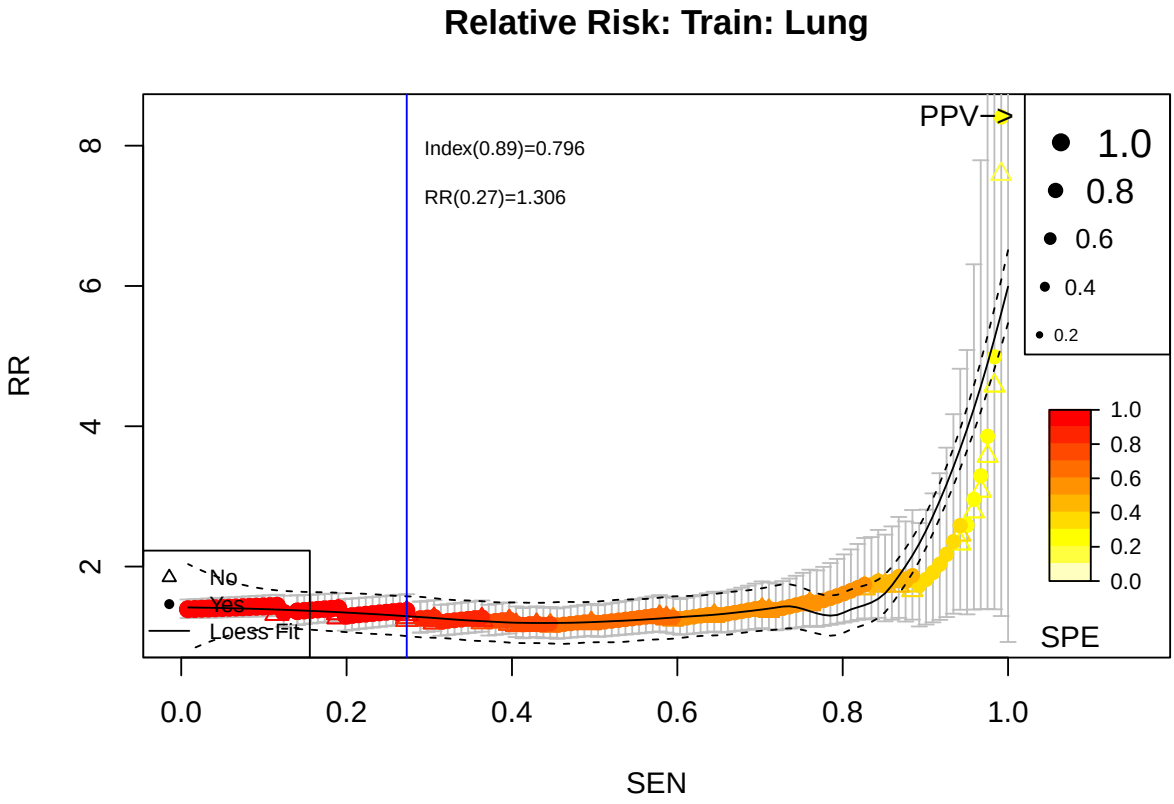
h0	Gain	DeltaTime
1.29	1.52	749

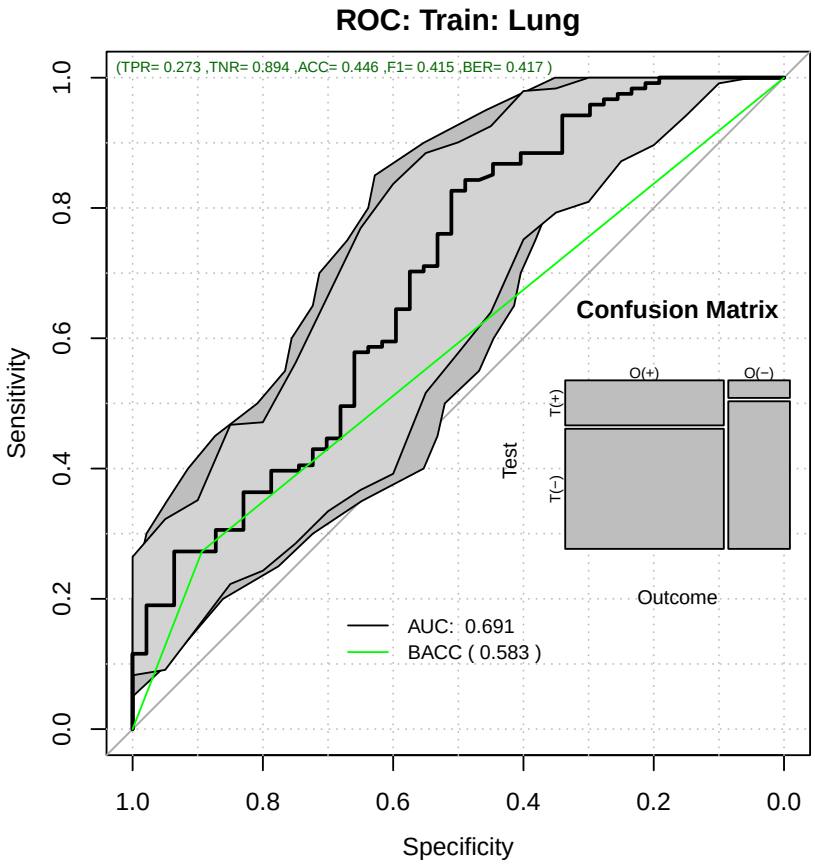
1.4.4 The RRplot() of the calibrated model

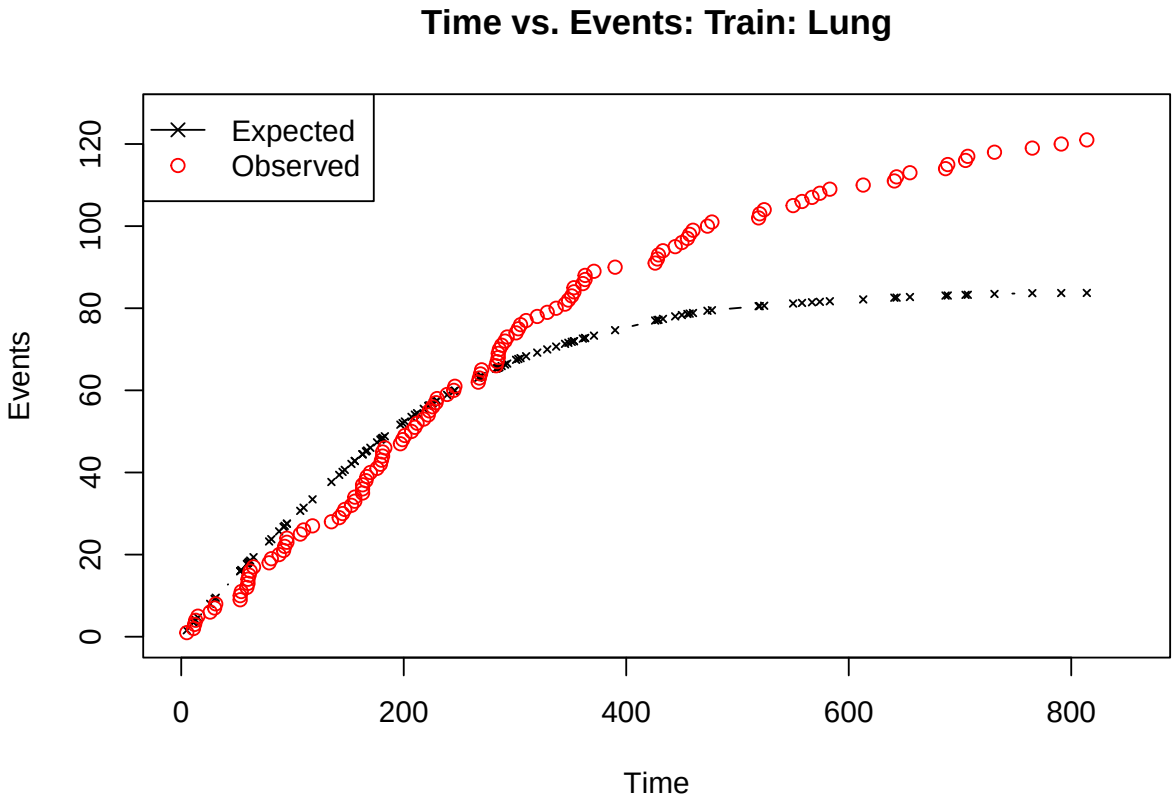
```
h0 <- calprob$h0
timeinterval <- calprob$timeInterval;

rdata <- cbind(lung$status,calprob$prob)


rrAnalysisTrain <- RRPlot(rdata,atProb=c(0.90),
                      timetoEvent=lung$time,
                      title="Train: Lung",
                      ysurvlim=c(0.00,1.0),
                      riskTimeInterval=timeinterval)
```

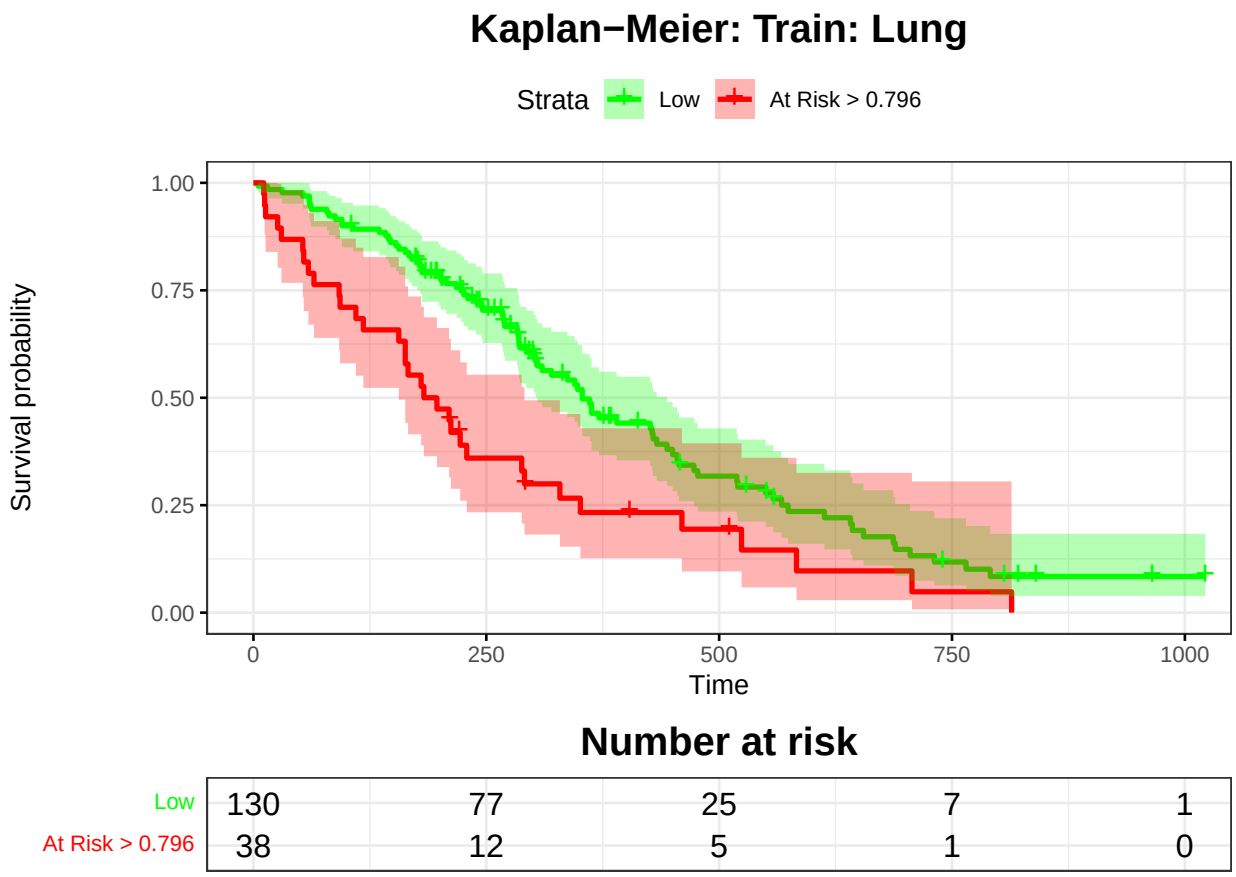

Cumulative vs. Observed: Train: Lung
Observed
0
20
40
60
80
100
120
Event
Expected
0
20
40
60
80
100
120
Cumulative Probability


Decision Curve Analysis: Train: Lung
No Event
Event
loess fit
SEN
1.0
0.8
0.6
0.4
0.2
0.0
Treat All
Treat None
Net Benefit
0.0
0.2
0.4
0.6
0.8
Threshold


Relative Risk: Train: Lung
PPV
Index(0.89)=0.796
RR(0.27)=1.306
1.0
0.8
0.6
0.4
0.2
1.0
0.8
0.6
0.4
0.2
0.0
SPE
No
Yes
Loess Fit
RR
2
4
6
8
0.0
0.2
0.4
0.6
0.8
1.0
SEN


ROC: Train: Lung
(TPR= 0.273 ,TNR= 0.894 ,ACC= 0.446 ,F1= 0.415 ,BER= 0.417)
Sensitivity
Specificity
1.0
0.8
0.6
0.4
0.2
0.0
Confusion Matrix
O(+)
O(−)
T(+)
T(−)
Test
Outcome
AUC: 0.691
BACC (0.583)


Time vs. Events: Train: Lung
Expected
Observed
Events
0
20
40
60
80
100
120
0
200
400
600
800
Time



1.4.5 Calibrated Train Performance

```
pander::pander(t(rrAnalysisTrain$OERatio),caption="O/E Ratio")
```

Table 26: O/E Ratio

est	lower	upper
1.45	1.2	1.73

```
pander::pander(t(rrAnalysisTrain$OE95ci),caption="O/E Ratio")
```

Table 27: O/E Ratio

mean	50%	2.5%	97.5%
1.04	1.04	0.996	1.08

```
pander::pander(t(rrAnalysisTrain$OAcum95ci),caption="O/Acum Ratio")
```

Table 28: O/Acum Ratio

mean	50%	2.5%	97.5%
1.01	1.01	0.999	1.01

```
pander::pander(rrAnalysisTrain$c.index$cstatCI,caption="C. Index")
```

mean.C Index	median	lower	upper
0.651	0.65	0.591	0.71

```
pander::pander(t(rrAnalysisTrain$ROCAnalysis$aucs),caption="ROC AUC")
```

Table 30: ROC AUC

est	lower	upper
0.691	0.598	0.784

```
pander::pander((rrAnalysisTrain$ROCAnalysis$sensitivity),caption="Sensitivity")
```

Table 31: Sensitivity

est	lower	upper
0.273	0.196	0.361

```
pander::pander((rrAnalysisTrain$ROCAnalysis$specificity),caption="Specificity")
```

Table 32: Specificity

est	lower	upper
0.894	0.769	0.965

```
pander::pander(t(rrAnalysisTrain$thr_atP),caption="Probability Thresholds")
```

Table 33: Probability Thresholds

90%
0.796

```
pander::pander(t(rrAnalysisTrain$RR_atP),caption="Risk Ratio")
```

Table 34: Risk Ratio

est	lower	upper
1.31	1.11	1.54

```
pander::pander(rrAnalysisTrain$surdif,caption="Logrank test")
```

Table 35: Logrank test Chisq = 10.879375 on 1 degrees of freedom, p = 0.000972

	N	Observed	Expected	(O-E)^2/E	(O-E)^2/V
class=0	130	88	101.3	1.76	10.9
class=1	38	33	19.7	9.05	10.9

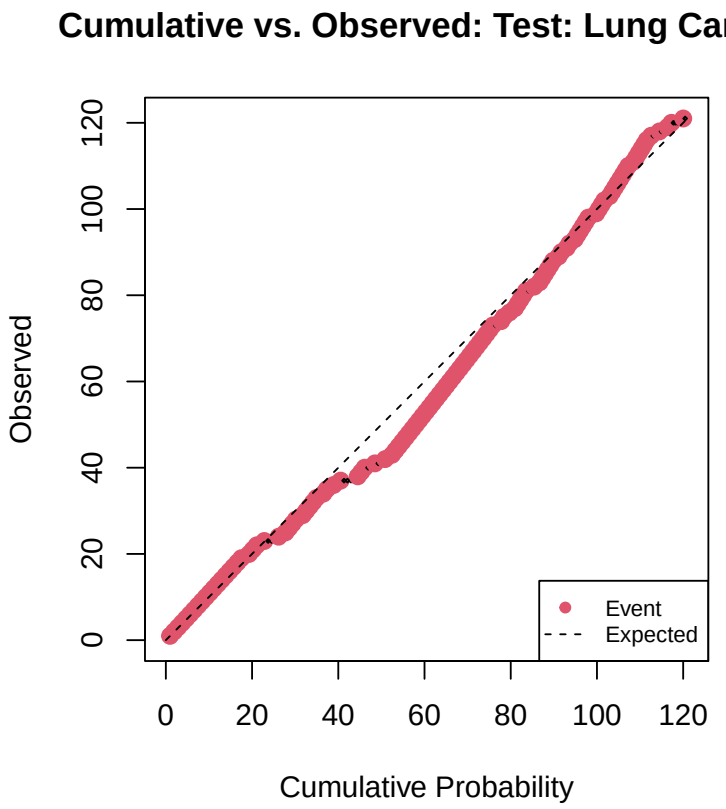
1.5 Cross-Validation

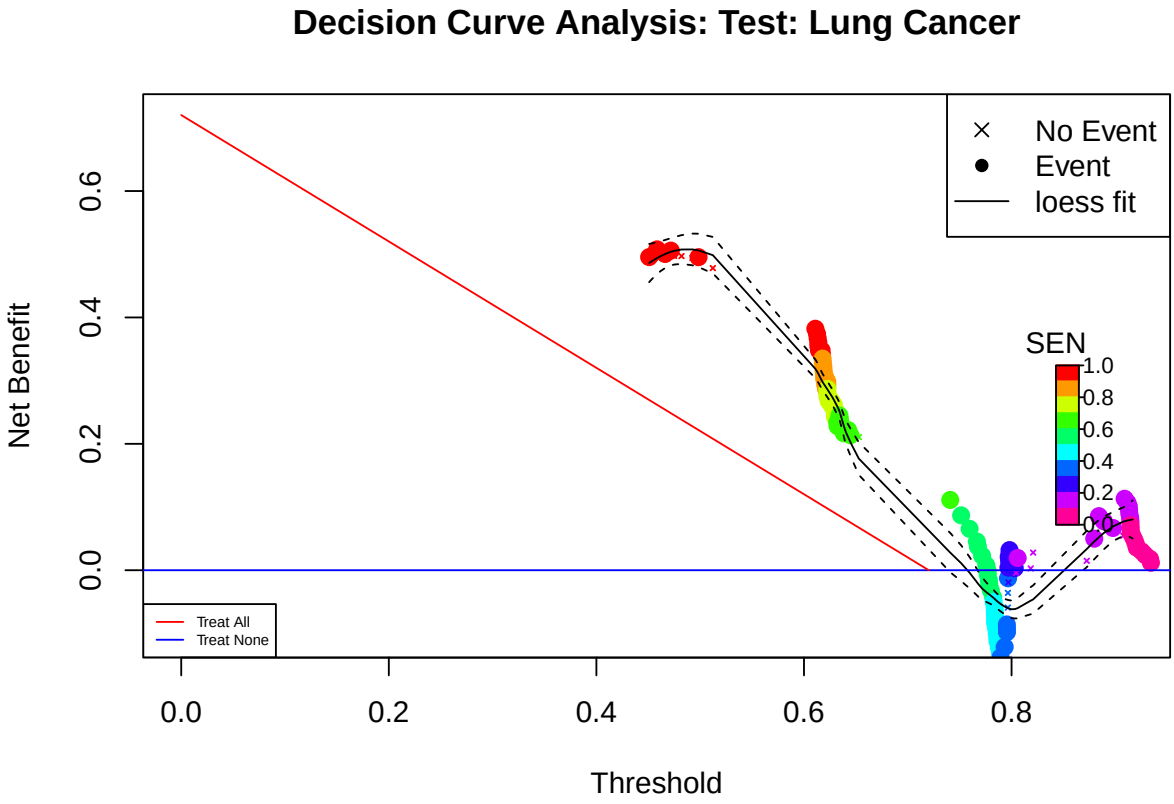
```
rcv <- randomCV(theData=lung,
                theOutcome = Surv(time,status)~1,
                fittingFunction=BSWiMS.model,
                trainFraction = 0.95,
                repetitions=200,
                classSamplingType = "Pro"
        )
```

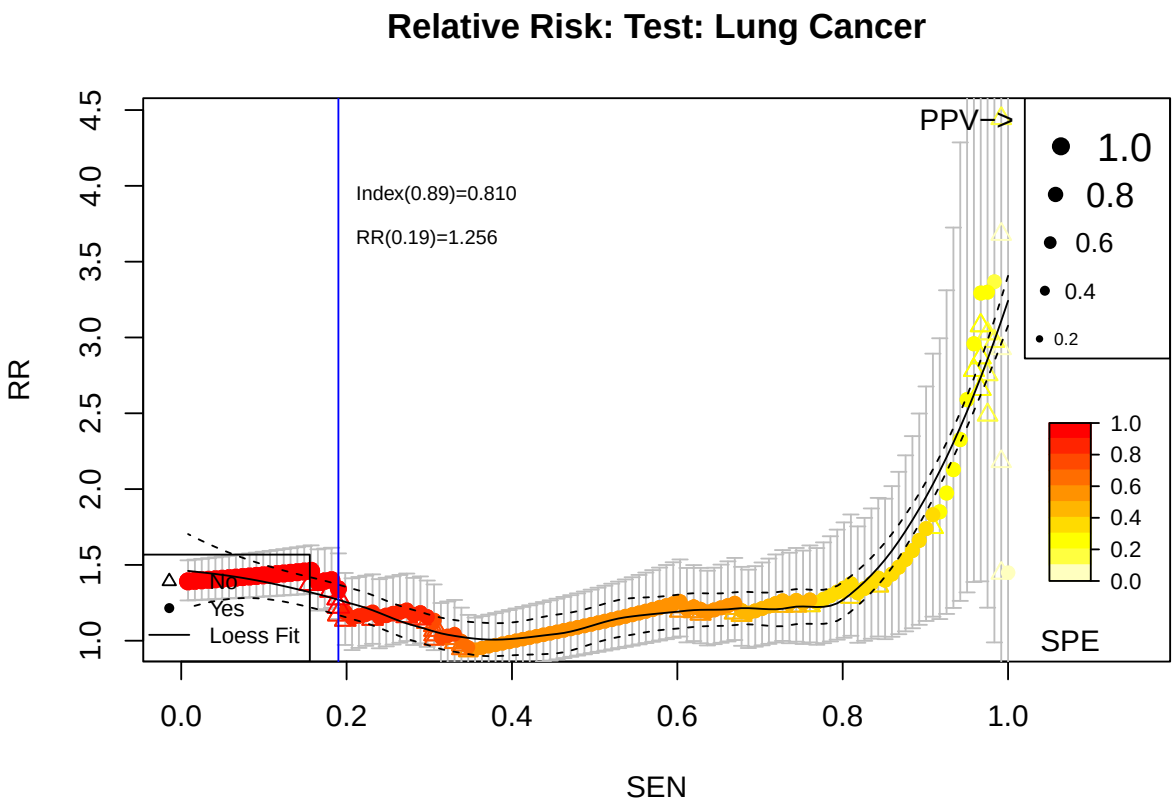
.[+++].[+++].[++-].[+++].[++].[+].[++].[++].[+++].[+++]10 Tested: 69 Avg. Selected: 3.3 Min Tests: 1 Max Tests: 3 Mean Tests: 1.449275 . MAD: 0.4822321 .[++].[++].[+].[++].[++].[+++].[+++].[++++].[+++].[++]20 Tested: 117 Avg. Selected: 3.35 Min Tests: 1 Max Tests: 5 Mean Tests: 1.709402 . MAD: 0.4774963 .[++].[+++].[++].[+++].[++].[++-].[+++].[++].[++-].[++]30 Tested: 141 Avg. Selected: 3.333333 Min Tests: 1 Max Tests: 6 Mean Tests: 2.12766 . MAD: 0.4761588 .[+++].[++].[++++].[+++].[++].[+++].[+++].[+++].[+++].[+]40 Tested: 152 Avg. Selected: 3.4 Min Tests: 1 Max Tests: 7 Mean Tests: 2.631579 . MAD: 0.4739485 .[++].[++++].[+++].[++++].[+++].[+].[+++].[++].[+].[+++]50 Tested: 161 Avg. Selected: 3.44 Min Tests: 1 Max Tests: 8 Mean Tests: 3.10559 . MAD: 0.476395 .[++].[++].[++].[++].[++].[+++].[++].[+++].[+++].[++-]60 Tested: 164 Avg. Selected: 3.416667 Min Tests: 1 Max Tests: 10 Mean Tests: 3.658537 . MAD: 0.475574 .[+++].[+++].[+++].[+++].[++].[+++].[++].[+++].[+++-].[+++]70 Tested: 166 Avg. Selected: 3.471429 Min Tests: 1 Max Tests: 10 Mean Tests: 4.216867 . MAD: 0.4761199 .[+++].[+++].[+++].[+++].[+++].[+++].[+++].[+].[++].[++]80 Tested: 166 Avg. Selected: 3.4875 Min Tests: 1 Max Tests: 10 Mean Tests: 4.819277 . MAD: 0.4762632 .[+++].[++].[+++].[+].[+++].[+++].[++-].[+++].[+].[+]90 Tested: 167 Avg. Selected: 3.444444 Min Tests: 1 Max Tests: 10 Mean Tests: 5.389222 . MAD: 0.4751278 .[++].[++].[+++].[++++].[+++].[+++].[+++].[+++].[++++].[++++]100 Tested: 167 Avg. Selected: 3.51 Min Tests: 1 Max Tests: 12 Mean Tests: 5.988024 . MAD: 0.4752975 .[+++].[+].[+++].[+++].[+++].[+++].[+++].[+++].[+++].[+++]110 Tested: 167 Avg. Selected: 3.536364 Min Tests: 1 Max Tests: 15 Mean Tests: 6.586826 . MAD: 0.4749925 .[+++].[+++].[++].[+++].[++].[+++].[+++].[+++].[++++].[++]120 Tested: 168 Avg. Selected: 3.558333 Min Tests: 1 Max Tests: 17 Mean Tests: 7.142857 . MAD: 0.4756236 .[+++].[+++].[++].[+++].[++].[+++].[++].[+++].[+].[+] Tested: 168 Avg. Selected: 3.546154 Min Tests: 1 Max Tests: 17 Mean Tests: 7.738095 . MAD: 0.4752674 .[++++].[+++].[+].[+++].[+++].[++].[++].[+++].[++].[+]140 Tested: 168 Avg. Selected: 3.535714 Min Tests: 1 Max Tests: 17 Mean Tests: 8.333333 . MAD: 0.4750797 .[+++].[++].[++-].[+++].[+++].[++-].[++].[++].[++-].[+++]150 Tested: 168 Avg. Selected: 3.526667 Min Tests: 1 Max Tests: 19 Mean Tests: 8.928571 . MAD: 0.4752041 .[+++].[+++].[++].[++].[+++].[+++].[++].[+++].[++++].[++]160 Tested: 168 Avg. Selected: 3.54375 Min Tests: 1 Max Tests: 20 Mean Tests: 9.52381 . MAD: 0.474961 .[+].[+++].[+++].[++].[+++].[++].[+++].[+].[++].[++++]170 Tested: 168 Avg. Selected: 3.529412 Min Tests: 1 Max Tests: 21 Mean Tests: 10.11905 . MAD: 0.4754508 .[++].[++++].[+++].[+++].[+++].[+++].[+++].[+++].[+].[

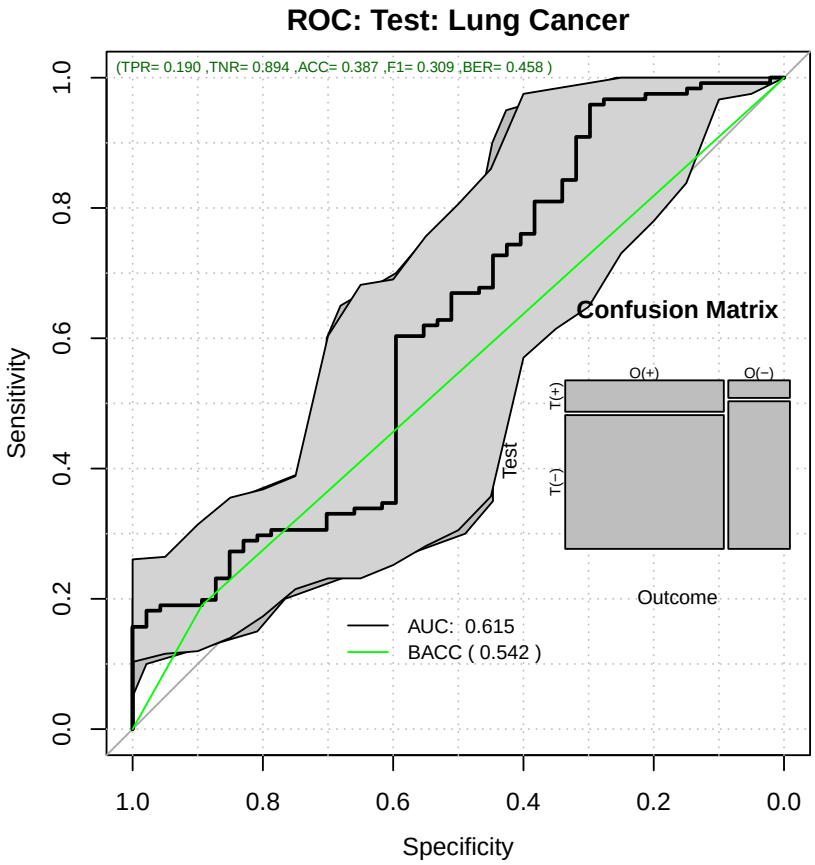
Tested: 168 Avg. Selected: 3.544444 Min Tests: 1 Max Tests: 21 Mean Tests: 10.71429 . MAD: 0.4753713
.[++].[+++].[+++].[+++].[+-].[++].[++].[+].[+++].[++]190 Tested: 168 Avg. Selected: 3.526316 Min Tests:
2 Max Tests: 21 Mean Tests: 11.30952 . MAD: 0.475501 .[+++].[++].[++++].[+++].[++++].[+++].[++++].[+++].[+++].[+
Tested: 168 Avg. Selected: 3.56 Min Tests: 2 Max Tests: 22 Mean Tests: 11.90476 . MAD: 0.4755006

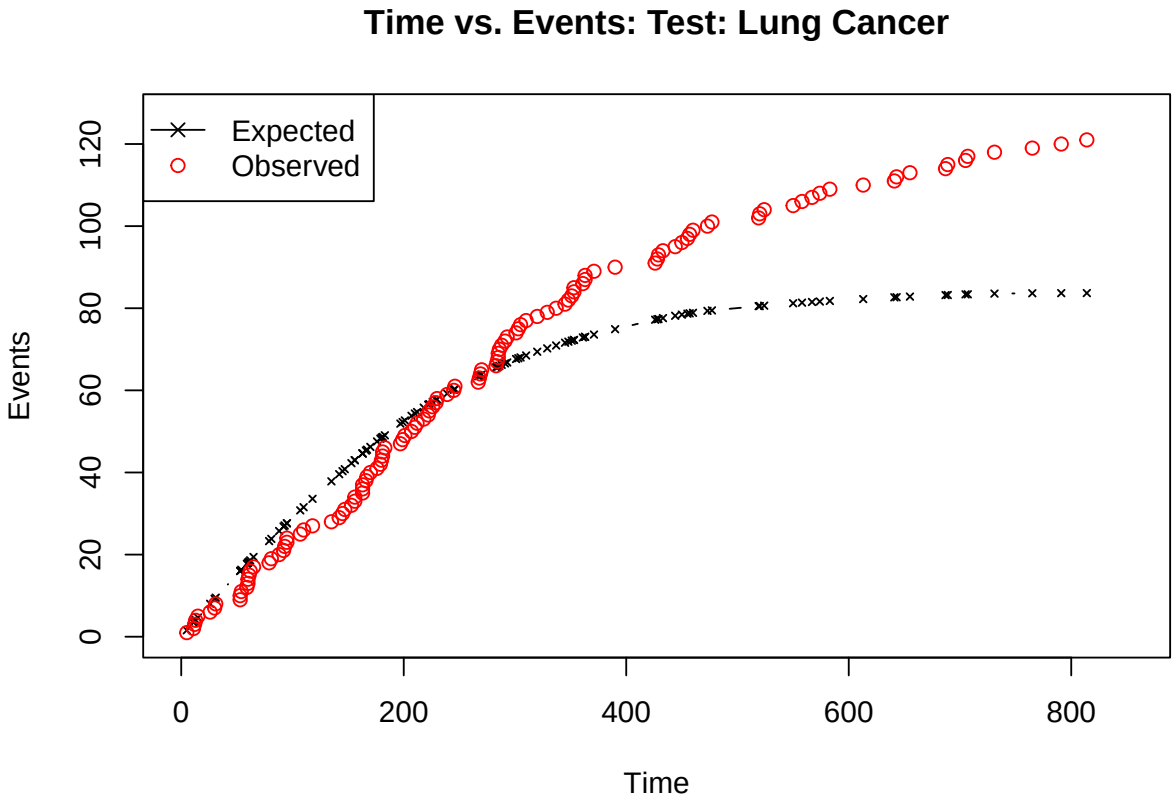
```
stp <- rcv$survTestPredictions
stp <- stp[!is.na(stp[,4]),]

bbx <- boxplot(unlist(stp[,1])~rownames(stp),plot=FALSE)
times <- bbx$stats[3,]
status <- boxplot(unlist(stp[,2])~rownames(stp),plot=FALSE)$stats[3,]
prob <- ppoisGzero(boxplot(unlist(stp[,4])~rownames(stp),plot=FALSE)$stats[3,],h0)

rdatacv <- cbind(status,prob)
rownames(rdatacv) <- bbx$names
names(times) <- bbx$names

rrAnalysisTest <- RRPlot(rdatacv,atProb=c(0.90),
                     timetoEvent=times,
                     title="Test: Lung Cancer",
                     ysurvlim=c(0.00,1.0),
                     riskTimeInterval=timeinterval)
```

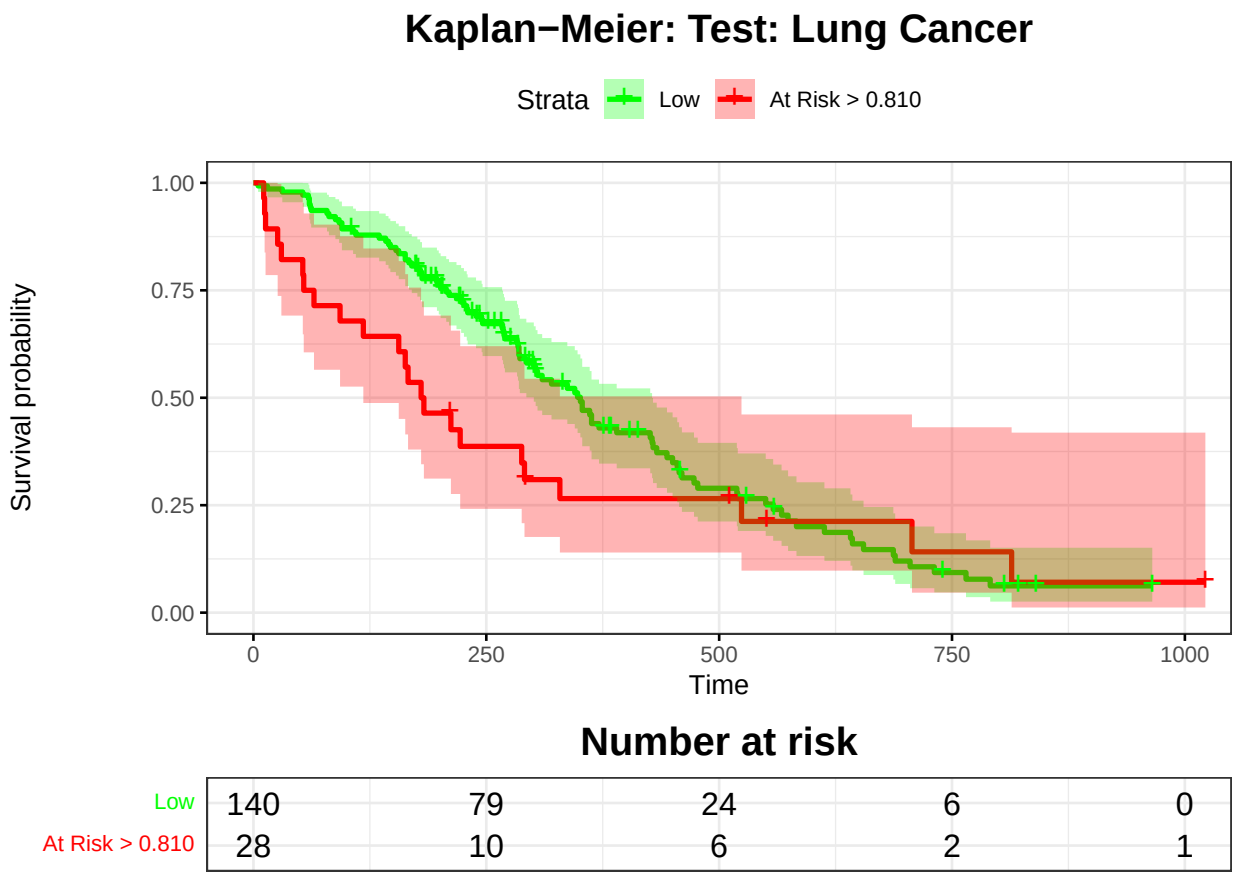



Decision Curve Analysis: Test: Lung Cancer
No Event
Event
loess fit
SEN
1.0
0.8
0.6
0.4
0.2
0.0
Treat All
Treat None
Net Benefit
0.0
0.2
0.4
0.6
0.0
0.2
0.4
0.6
0.8
Threshold


Relative Risk: Test: Lung Cancer
RR
SEN
PPV–>
Index(0.89)=0.810
RR(0.19)=1.256
No
Yes
Loess Fit
SPE
1.0
0.8
0.6
0.4
0.2
0.0
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
0.0
0.2
0.4
0.6
0.8
1.0


ROC: Test: Lung Cancer
(TPR= 0.190 ,TNR= 0.894 ,ACC= 0.387 ,F1= 0.309 ,BER= 0.458)
Sensitivity
Specificity
1.0
0.8
0.6
0.4
0.2
0.0
Confusion Matrix
O(+)
O(−)
T(+)
T(−)
Test
Outcome
AUC: 0.615
BACC (0.542)


Time vs. Events: Test: Lung Cancer
Expected
Observed
Events
0
20
40
60
80
100
120
0
200
400
600
800
Time



1.5.1 Cross-Validation Test Performance

```
pander::pander(t(rrAnalysisTest$OERatio),caption="O/E Ratio")
```

Table 36: O/E Ratio

est	lower	upper
1.45	1.2	1.73

```
pander::pander(t(rrAnalysisTest$OE95ci),caption="O/E Ratio")
```

Table 37: O/E Ratio

mean	50%	2.5%	97.5%
1.03	1.03	0.996	1.07

```
pander::pander(t(rrAnalysisTest$OAcum95ci),caption="O/Acum Ratio")
```

Table 38: O/Acum Ratio

mean	50%	2.5%	97.5%
0.961	0.962	0.95	0.972

```
pander::pander(rrAnalysisTest$c.index$cstatCI,caption="C. Index")
```

mean.C Index	median	lower	upper
0.601	0.601	0.536	0.66

```
pander::pander(t(rrAnalysisTest$ROCAnalysis$aucs),caption="ROC AUC")
```

Table 40: ROC AUC

est	lower	upper
0.615	0.515	0.715

```
pander::pander((rrAnalysisTest$ROCAnalysis$sensitivity),caption="Sensitivity")
```

Table 41: Sensitivity

est	lower	upper
0.19	0.124	0.271

```
pander::pander((rrAnalysisTest$ROCAnalysis$specificity),caption="Specificity")
```

Table 42: Specificity

est	lower	upper
0.894	0.769	0.965

```
pander::pander(t(rrAnalysisTest$thr_atP),caption="Probability Thresholds")
```

Table 43: Probability Thresholds

90%
0.81

```
pander::pander(t(rrAnalysisTest$RR_atP),caption="Risk Ratio")
```

Table 44: Risk Ratio

est	lower	upper
1.26	1.05	1.51

```
pander::pander(rrAnalysisTest$surdif,caption="Logrank test")
```

Table 45: Logrank test Chisq = 2.346444 on 1 degrees of freedom, p = 0.125569

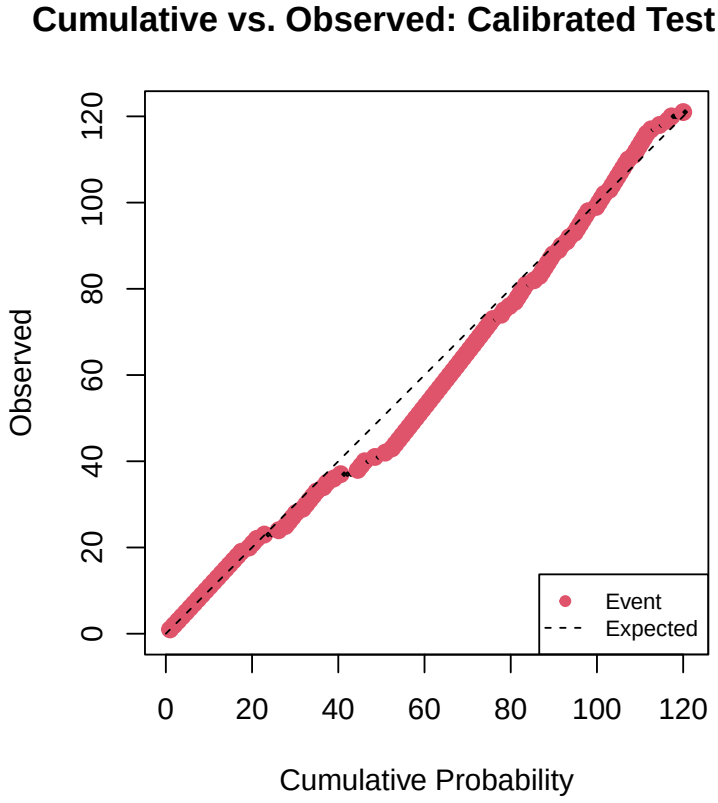
	N	Observed	Expected	(O-E)^2/E	(O-E)^2/V
class=0	140	98	103.8	0.328	2.35
class=1	28	23	17.2	1.981	2.35

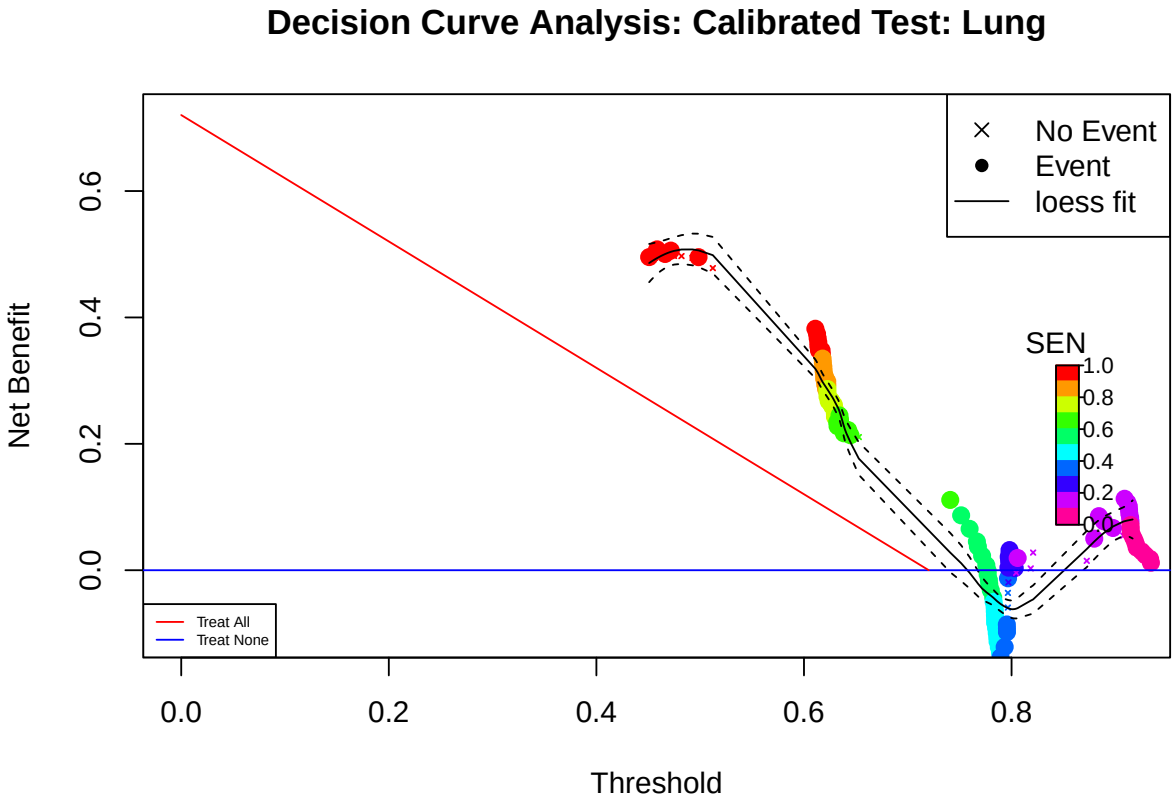
1.5.2 Calibrating the test results

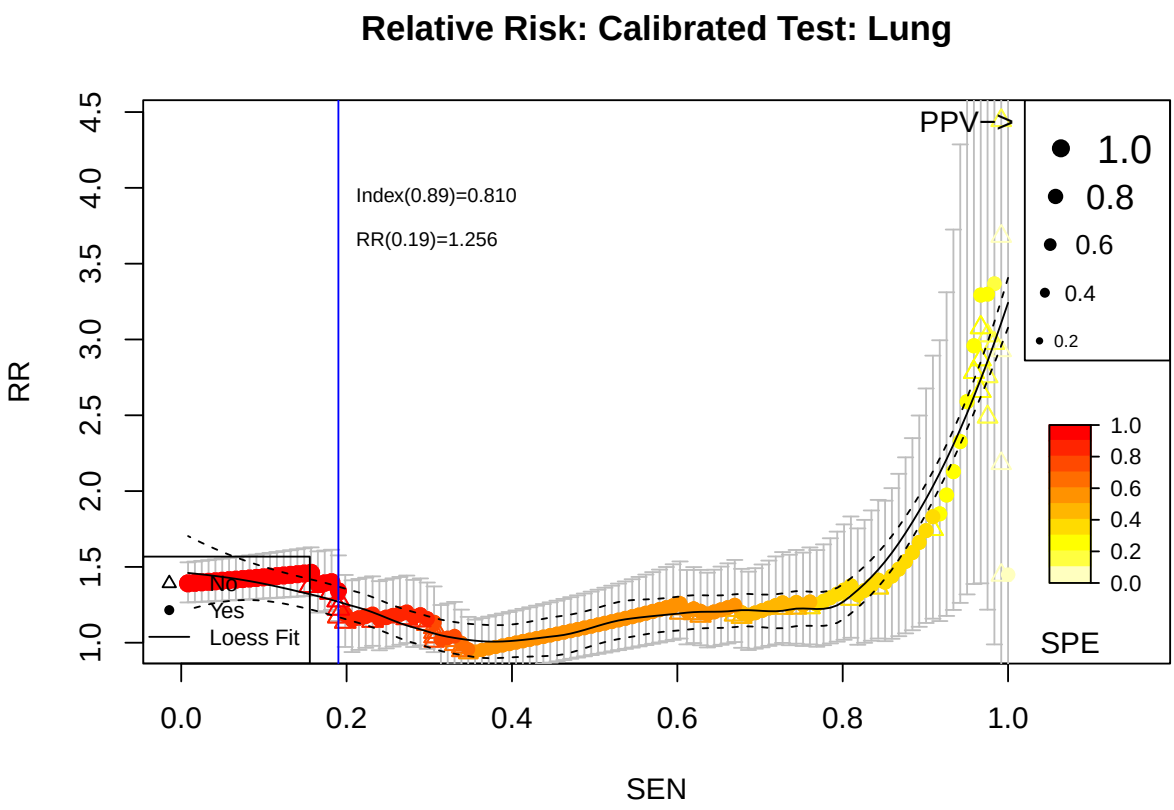
```
rdatacv <- cbind(status,prob,times)
calprob <- CalibrationProbPoissonRisk(rdatacv)

pander::pander(c(h0=calprob$h0,
                 Gain=calprob$hazardGain,
                 DeltaTime=calprob$timeInterval),
               caption="Cox Calibration Parameters")
```

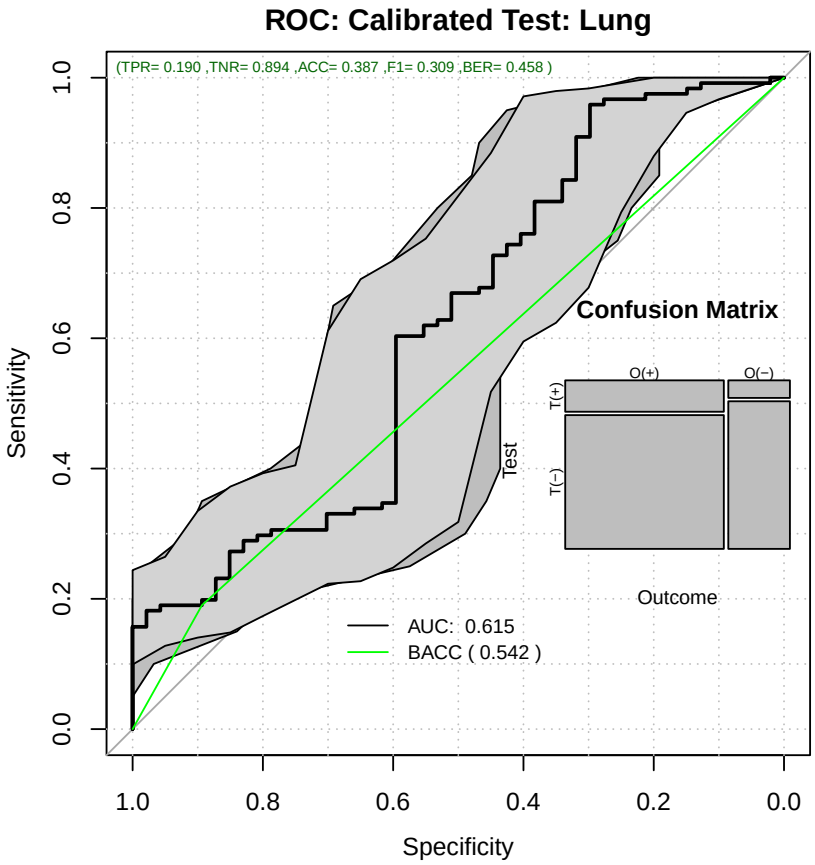
h0	Gain	DeltaTime
0.85	1	752

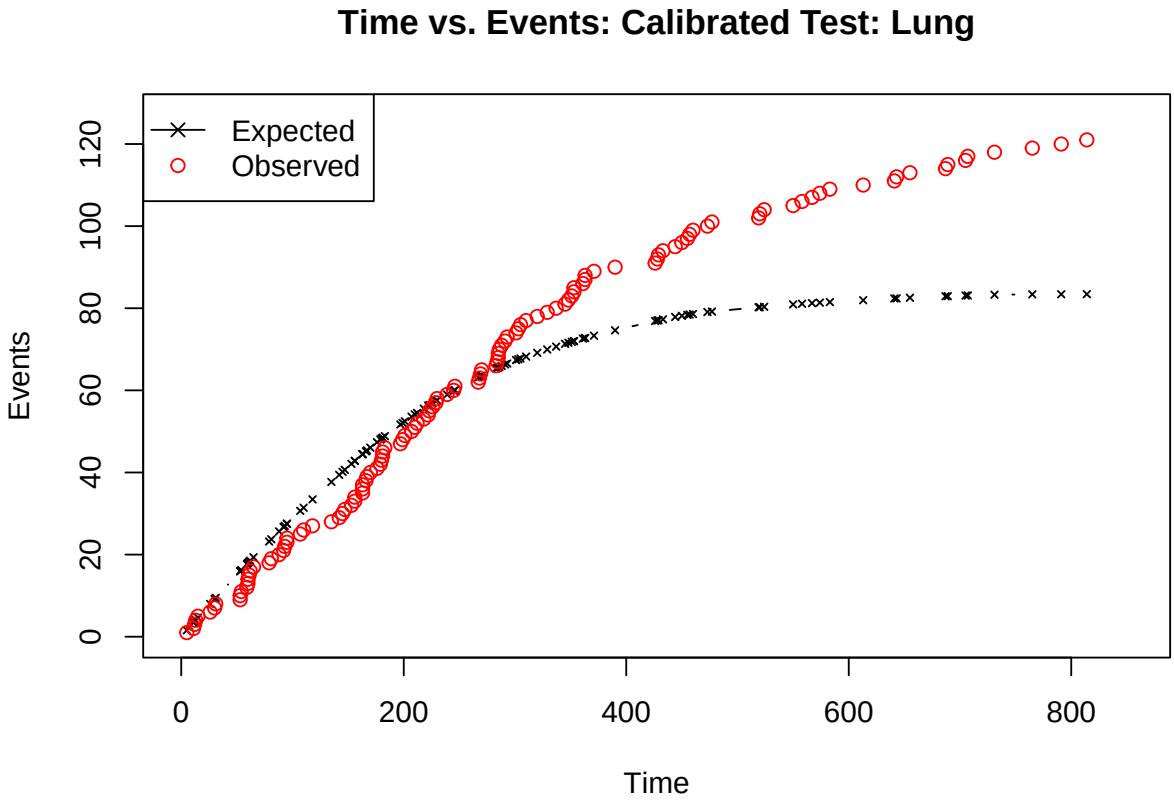
```
timeinterval <- calprob$timeInterval;

rdata <- cbind(status,calprob$prob)


rrAnalysisTest <- RRPlot(rdata,atProb=c(0.90),
                     timetoEvent=times,
                     title="Calibrated Test: Lung",
                     ysurvlim=c(0.00,1.0),
                     riskTimeInterval=timeinterval)
```

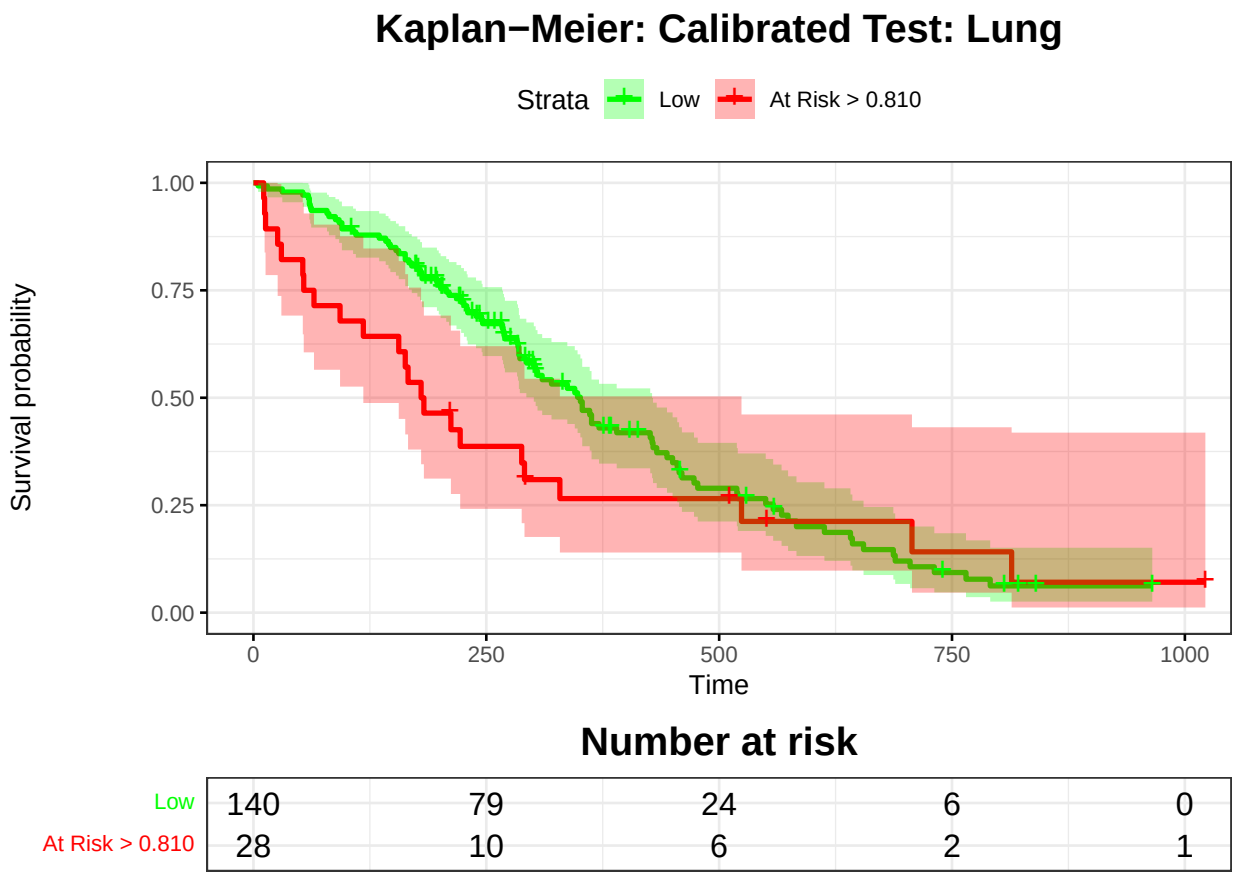

Cumulative vs. Observed: Calibrated Test: Lung
Observed
0
20
40
60
80
100
120
Cumulative Probability
Event
Expected


Decision Curve Analysis: Calibrated Test: Lung
No Event
Event
loess fit
SEN
1.0
0.8
0.6
0.4
0.2
0.0
Treat All
Treat None
Net Benefit
0.0
0.2
0.4
0.6
0.0
0.2
0.4
0.6
0.8
Threshold


Relative Risk: Calibrated Test: Lung
RR
SEN
PPV–>
Index(0.89)=0.810
RR(0.19)=1.256
No
Yes
Loess Fit
SPE
1.0
0.8
0.6
0.4
0.2
0.0
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
0.0
0.2
0.4
0.6
0.8
1.0


ROC: Calibrated Test: Lung
(TPR= 0.190 ,TNR= 0.894 ,ACC= 0.387 ,F1= 0.309 ,BER= 0.458)
Sensitivity
Specificity
1.0
0.8
0.6
0.4
0.2
0.0
Confusion Matrix
O(+)
O(−)
T(+)
T(−)
Test
Outcome
AUC: 0.615
BACC (0.542)


Time vs. Events: Calibrated Test: Lung
Expected
Observed
Events
0
20
40
60
80
100
120
0
200
400
600
800
Time



1.5.3 Calibrated Test Performance

```
pander::pander(t(rrAnalysisTest$OERatio),caption="O/E Ratio")
```

Table 47: O/E Ratio

est	lower	upper
1.45	1.2	1.73

```
pander::pander(t(rrAnalysisTest$OE95ci),caption="O/E Ratio")
```

Table 48: O/E Ratio

mean	50%	2.5%	97.5%
1.04	1.04	0.998	1.08

```
pander::pander(t(rrAnalysisTest$OAcum95ci),caption="O/Acum Ratio")
```

Table 49: O/Acum Ratio

mean	50%	2.5%	97.5%
0.961	0.961	0.951	0.972

```
pander::pander(rrAnalysisTest$c.index$cstatCI,caption="C. Index")
```

mean.C Index	median	lower	upper
0.601	0.602	0.536	0.664

```
pander::pander(t(rrAnalysisTest$ROCAnalysis$aucs),caption="ROC AUC")
```

Table 51: ROC AUC

est	lower	upper
0.615	0.515	0.715

```
pander::pander((rrAnalysisTest$ROCAnalysis$sensitivity),caption="Sensitivity")
```

Table 52: Sensitivity

est	lower	upper
0.19	0.124	0.271

```
pander::pander((rrAnalysisTest$ROCAnalysis$specificity),caption="Specificity")
```

Table 53: Specificity

est	lower	upper
0.894	0.769	0.965

```
pander::pander(t(rrAnalysisTest$thr_atP),caption="Probability Thresholds")
```

Table 54: Probability Thresholds

90%
0.81

```
pander::pander(t(rrAnalysisTest$RR_atP),caption="Risk Ratio")
```

Table 55: Risk Ratio

est	lower	upper
1.26	1.05	1.51

```
pander::pander(rrAnalysisTest$surdif,caption="Logrank test")
```

Table 56: Logrank test Chisq = 2.346444 on 1 degrees of freedom, p = 0.125569

	N	Observed	Expected	(O-E)^2/E	(O-E)^2/V
class=0	140	98	103.8	0.328	2.35
class=1	28	23	17.2	1.981	2.35