Logistic Regression

```
##   x freq
## 1 1  103
## 2 2   97
## 3 3   80
## 4 4   59
## 5 5   33
## 6 6   23
## 7 7    8
```

```
##   x freq
## 1 0  280
## 2 1  123
```

Null Model

```
##
## Call:
## glm(formula = SR ~ 1, family = "binomial", data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -0.8534  -0.8534  -0.8534   1.5406   1.5406
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept)  -0.8226     0.1082  -7.605 2.86e-14 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 495.86  on 402  degrees of freedom
## Residual deviance: 495.86  on 402  degrees of freedom
## AIC: 497.86
##
## Number of Fisher Scoring iterations: 4
```

Logistic Regression: Full MOdel

```
##
## Call:
## glm(formula = SR ~ ., family = "binomial", data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.2292  -0.7166  -0.4464   0.7500   2.5519
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  1.536883   1.871297   0.821 0.411480
## FR2         -0.748638   0.399819  -1.872 0.061146 .
## FR3         -0.300777   0.395980  -0.760 0.447507
## NASA        -0.033996   0.026174  -1.299 0.194005
## TA          -0.044179   0.023371  -1.890 0.058711 .
## E           -0.030427   0.064553  -0.471 0.637392
## AGR         -0.040196   0.083259  -0.483 0.629246
## CS          -0.009136   0.088724  -0.103 0.917989
## NT          -0.022930   0.091724  -0.250 0.802598
## OP          -0.025989   0.076193  -0.341 0.733035
## AV           0.032082   0.027117   1.183 0.236771
## EM           0.051226   0.035564   1.440 0.149756
## Task         0.004177   0.038641   0.108 0.913925
## H            0.017119   0.007682   2.229 0.025847 *
## RS2         -0.430916   0.273368  -1.576 0.114952
## WH2          0.451210   0.515942   0.875 0.381826
## TWR          0.010094   0.009786   1.032 0.302291
## BF2          0.188344   0.285334   0.660 0.509201
## NP2         -1.154363   0.297503  -3.880 0.000104 ***
## NP3         -2.232105   0.409774  -5.447 5.12e-08 ***
## FA2         -0.329707   0.364195  -0.905 0.365304
## FA3         -0.370519   0.664366  -0.558 0.577048
## FA4          1.232638   0.539668   2.284 0.022368 *
## FA5          0.147314   0.854185   0.172 0.863074
## FA6          1.417047   0.529192   2.678 0.007412 **
## AP           0.293957   0.379209   0.775 0.438230
## PR2         -0.782123   0.574993  -1.360 0.173757
## PR3         -1.254213   0.584081  -2.147 0.031767 *
## PR4         -0.471266   0.560077  -0.841 0.400106
## PR5         -0.756391   0.571861  -1.323 0.185941
## DWH2        -0.561247   0.421207  -1.332 0.182705
## DWR          0.001256   0.008191   0.153 0.878181
## TS2          0.440537   0.280745   1.569 0.116608
## DS2         -0.476945   0.315833  -1.510 0.131013
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 495.86  on 402  degrees of freedom
## Residual deviance: 380.38  on 369  degrees of freedom
## AIC: 448.38
```

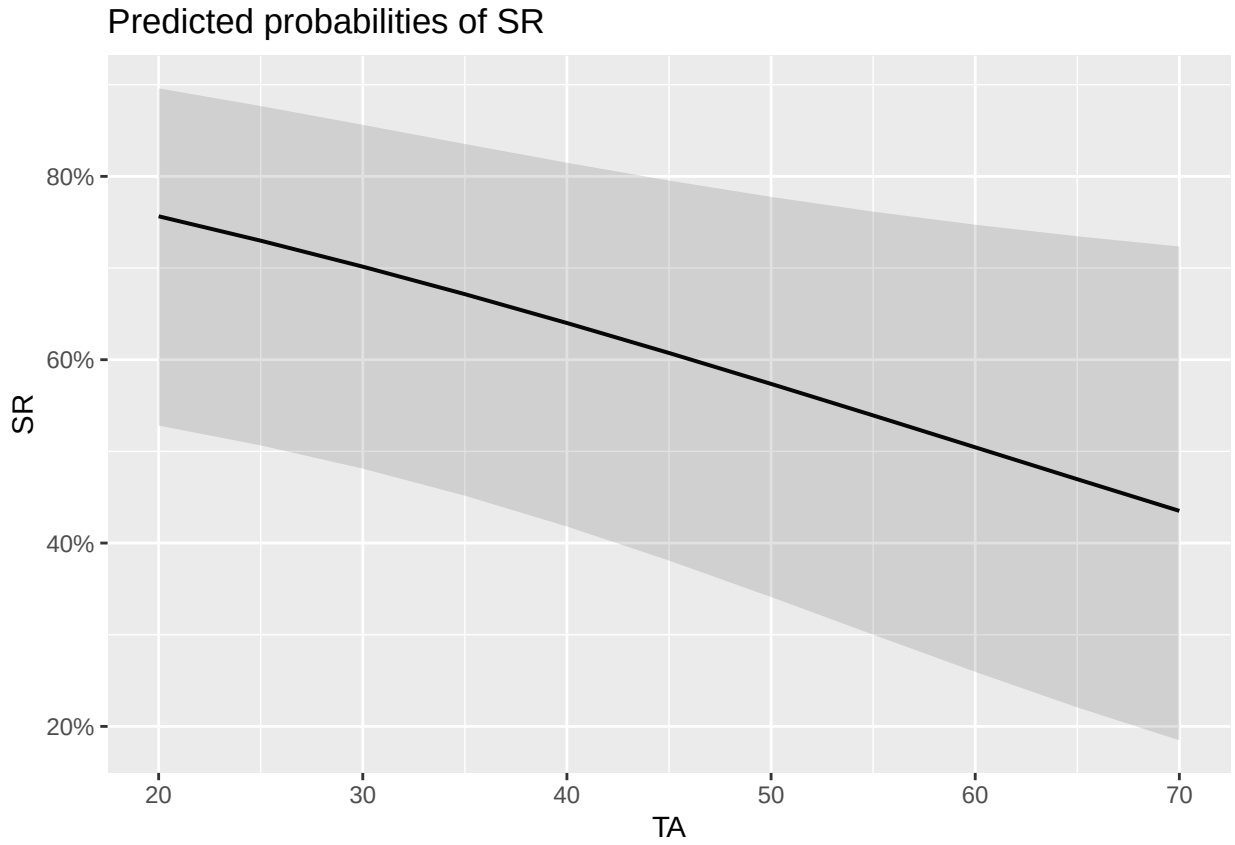
```
##
## Number of Fisher Scoring iterations: 5
```

Backward Elimination Model selection

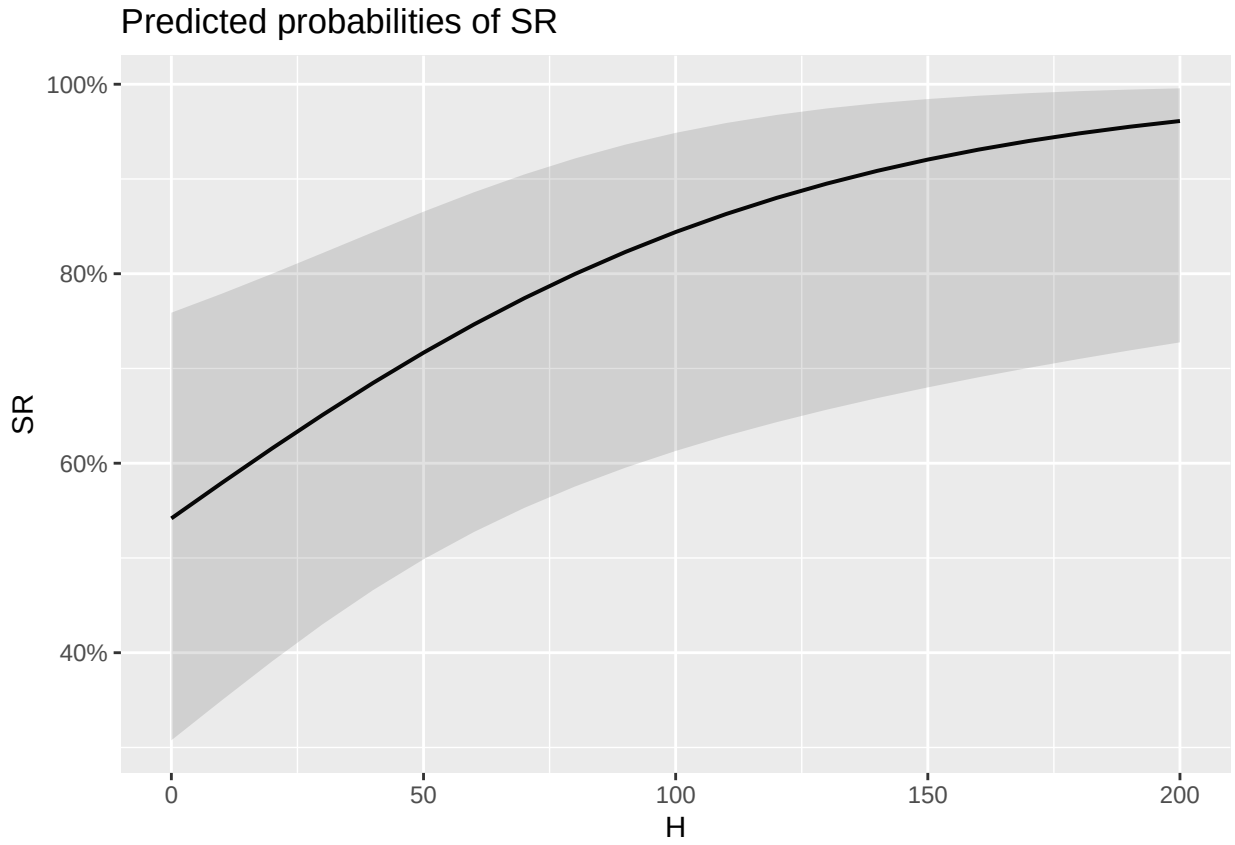
```
## Stepwise Model Path
## Analysis of Deviance Table
##
## Initial Model:
## SR ~ FR + NASA + TA + E + AGR + CS + NT + OP + AV + EM + Task +
##     H + RS + WH + TWR + BF + NP + FA + AP + PR + DWH + DWR +
##     TS + DS
##
## Final Model:
## SR ~ TA + H + RS + NP + FA + DWH + TS + DS
##
##
##      Step Df    Deviance Resid. Df Resid. Dev      AIC
## 1                              369   380.3849 448.3849
## 2    - CS  1 0.010599069       370   380.3955 446.3955
## 3  - Task  1 0.007629194       371   380.4031 444.4031
## 4   - DWR  1 0.027380813       372   380.4305 442.4305
## 5    - NT  1 0.070973216       373   380.5015 440.5015
## 6    - OP  1 0.119385228       374   380.6209 438.6209
## 7   - AGR  1 0.231659432       375   380.8525 436.8525
## 8     - E  1 0.307882765       376   381.1604 435.1604
## 9    - PR  4 6.388235802       380   387.5487 433.5487
## 10   - AP  1 0.471853407       381   388.0205 432.0205
## 11   - BF  1 0.539120732       382   388.5596 430.5596
## 12   - AV  1 0.540372466       383   389.1000 429.1000
## 13   - WH  1 0.982850389       384   390.0829 428.0829
## 14 - NASA  1 0.991763494       385   391.0746 427.0746
## 15   - EM  1 1.278869108       386   392.3535 426.3535
## 16   - FR  2 2.978607500       388   395.3321 425.3321
## 17  - TWR  1 1.599203491       389   396.9313 424.9313
```

Backward Elimination Model

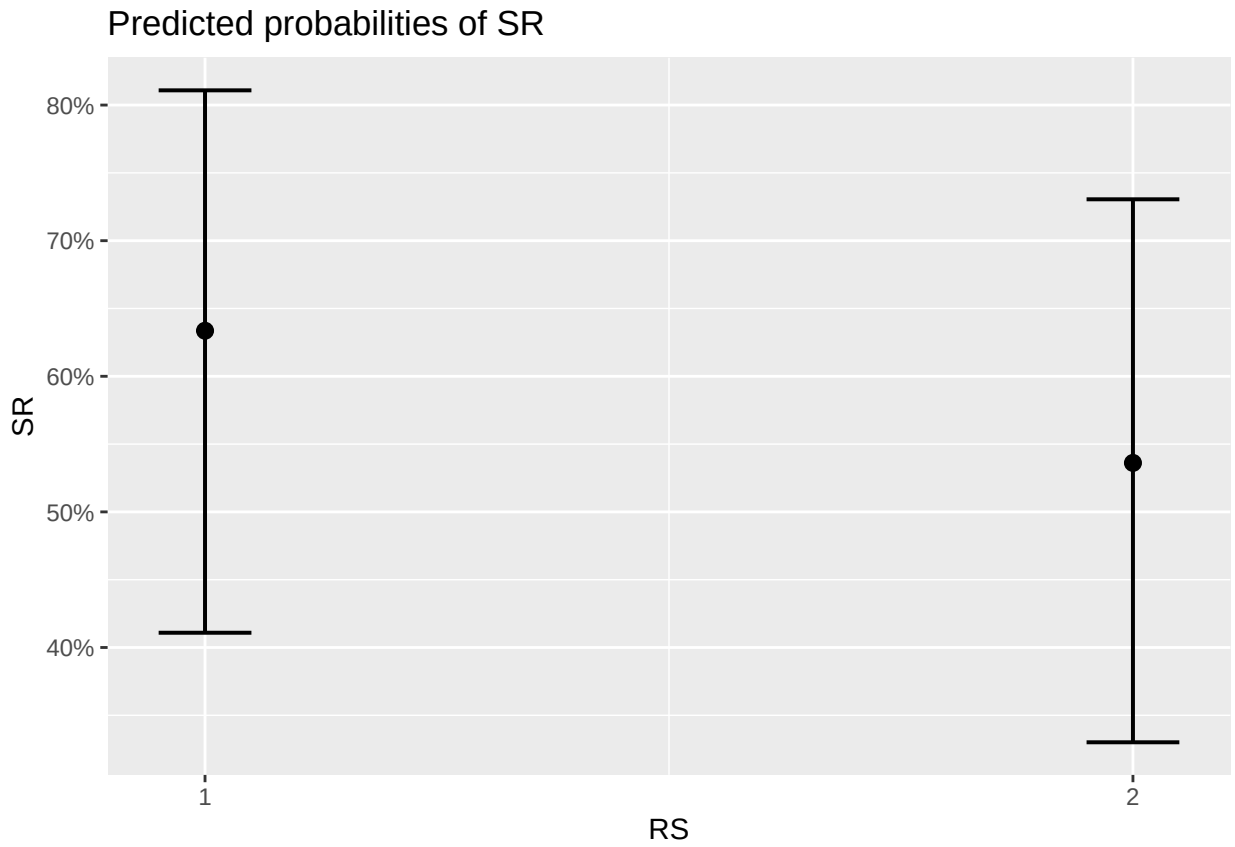
```
##
## Call:
## glm(formula = SR ~ TA + H + RS + NP + FA + DWH + TS + DS, family = "binomial",
##     data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.9666  -0.7499  -0.4682   0.8009   2.4752
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  1.310782   0.729660   1.796  0.07243 .
## TA          -0.027886   0.013203  -2.112  0.03467 *
## H            0.015209   0.006142   2.476  0.01329 *
## RS2         -0.402941   0.255856  -1.575  0.11528
## NP2         -1.029792   0.276937  -3.719  0.00020 ***
## NP3         -2.043547   0.369292  -5.534 3.14e-08 ***
## FA2         -0.242879   0.335335  -0.724  0.46889
## FA3         -0.084827   0.601628  -0.141  0.88787
## FA4          1.385549   0.507181   2.732  0.00630 **
## FA5          0.082085   0.792599   0.104  0.91751
## FA6          1.342090   0.509147   2.636  0.00839 **
## DWH2        -0.578448   0.380622  -1.520  0.12857
## TS2          0.407418   0.265909   1.532  0.12548
## DS2         -0.448631   0.297825  -1.506  0.13198
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 495.86  on 402  degrees of freedom
## Residual deviance: 396.93  on 389  degrees of freedom
## AIC: 424.93
##
## Number of Fisher Scoring iterations: 4

## Data were 'prettified'. Consider using `terms="TA [all]"` to get smooth plots.

## Data were 'prettified'. Consider using `terms="H [all]"` to get smooth plots.

## $TA
```


Predicted probabilities of SR
80%
60%
40%
20%
SR
20
30
40
50
60
70
TA

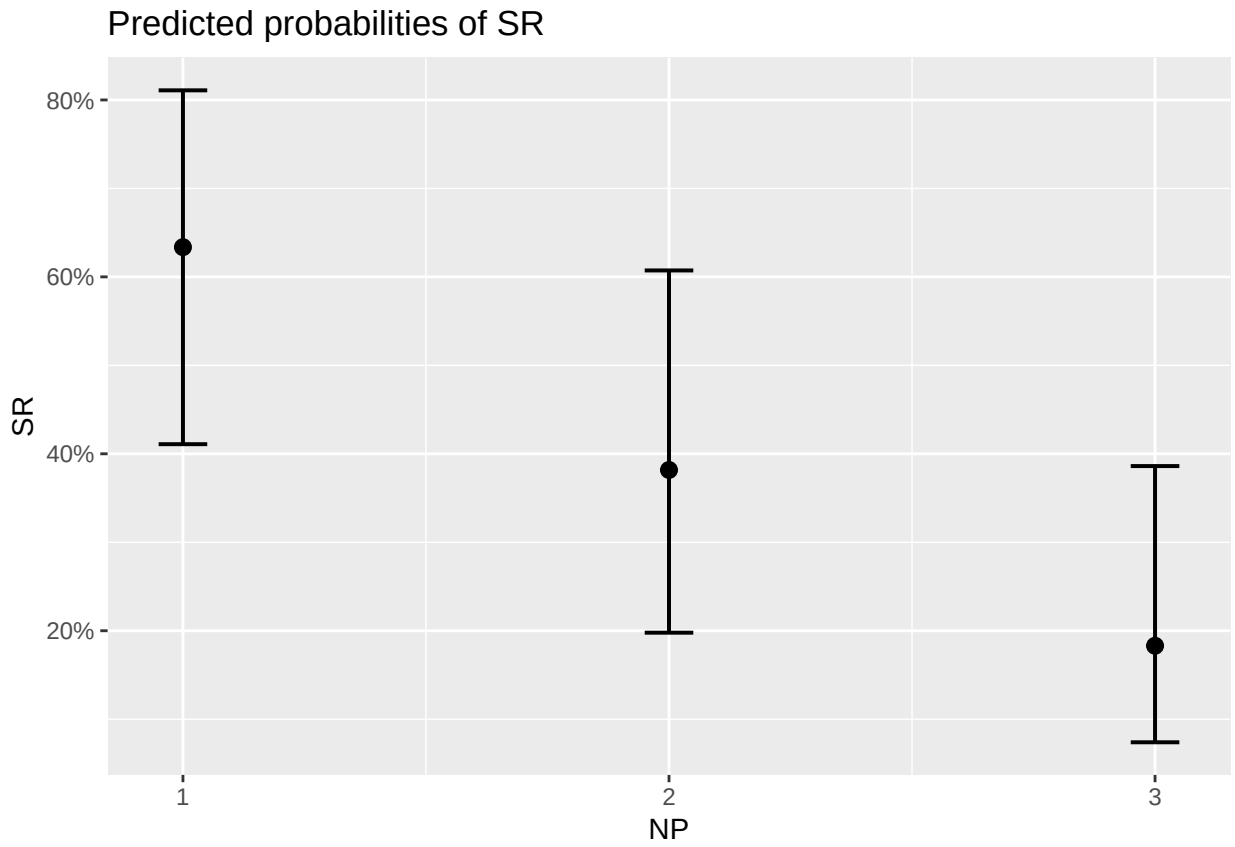
```
##
## $H
```


Predicted probabilities of SR
100%
80%
60%
40%
SR
0
50
100
150
200
H

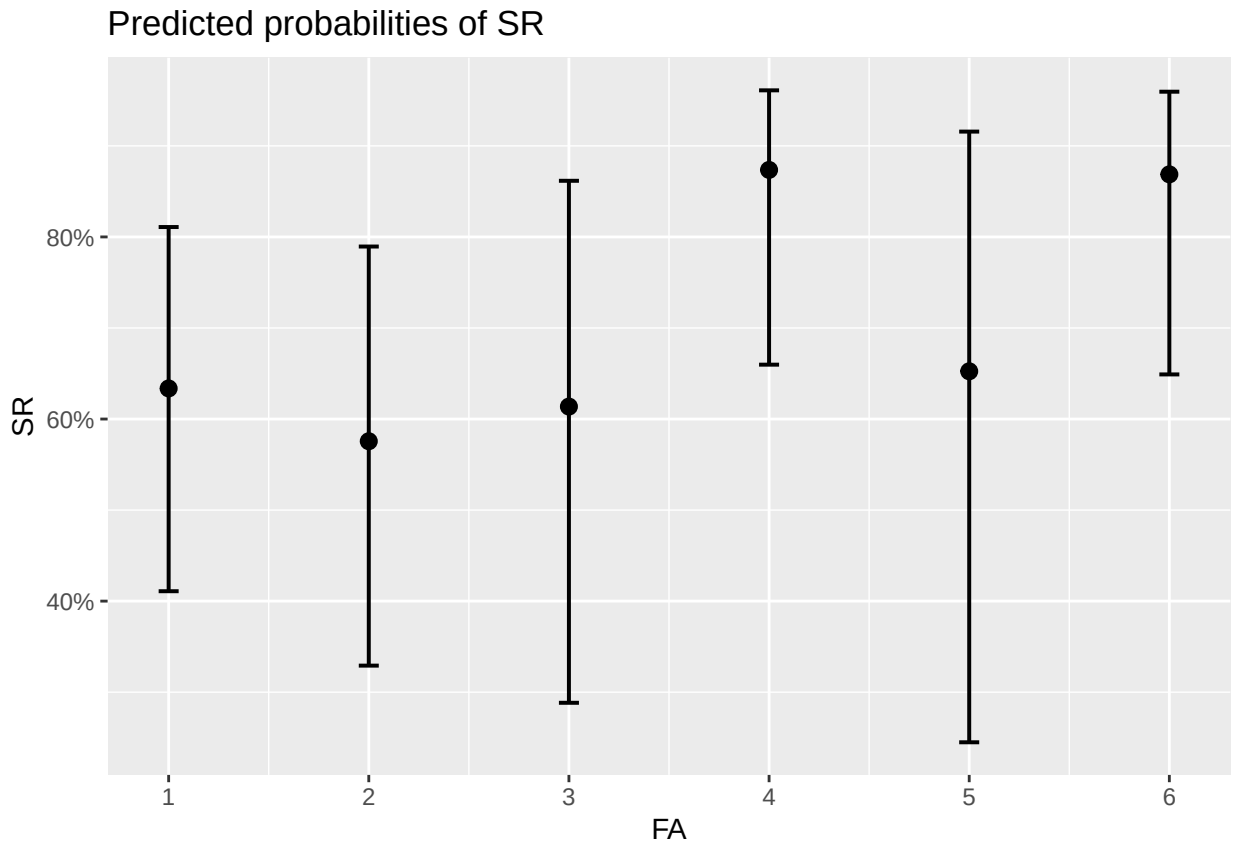
```
##
## $RS
```



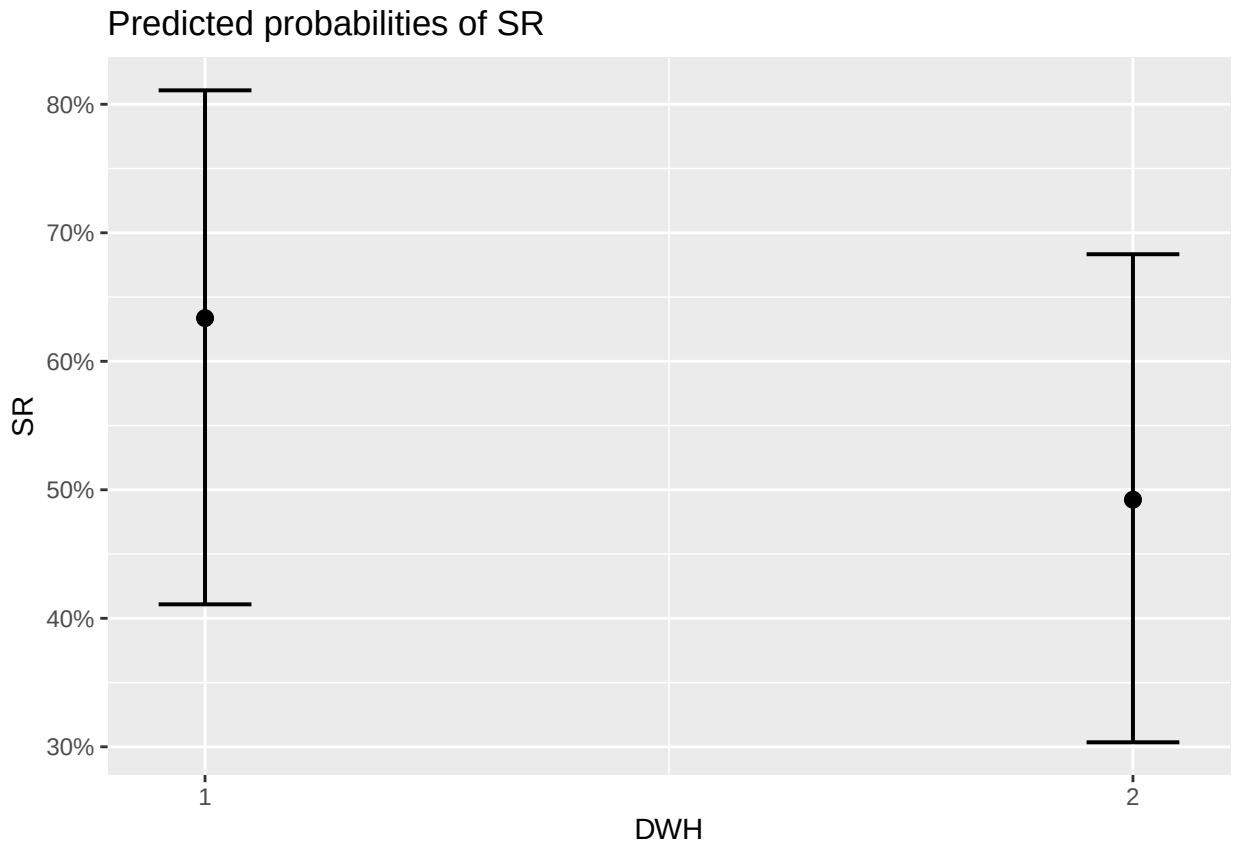

```
##
## $NP
```



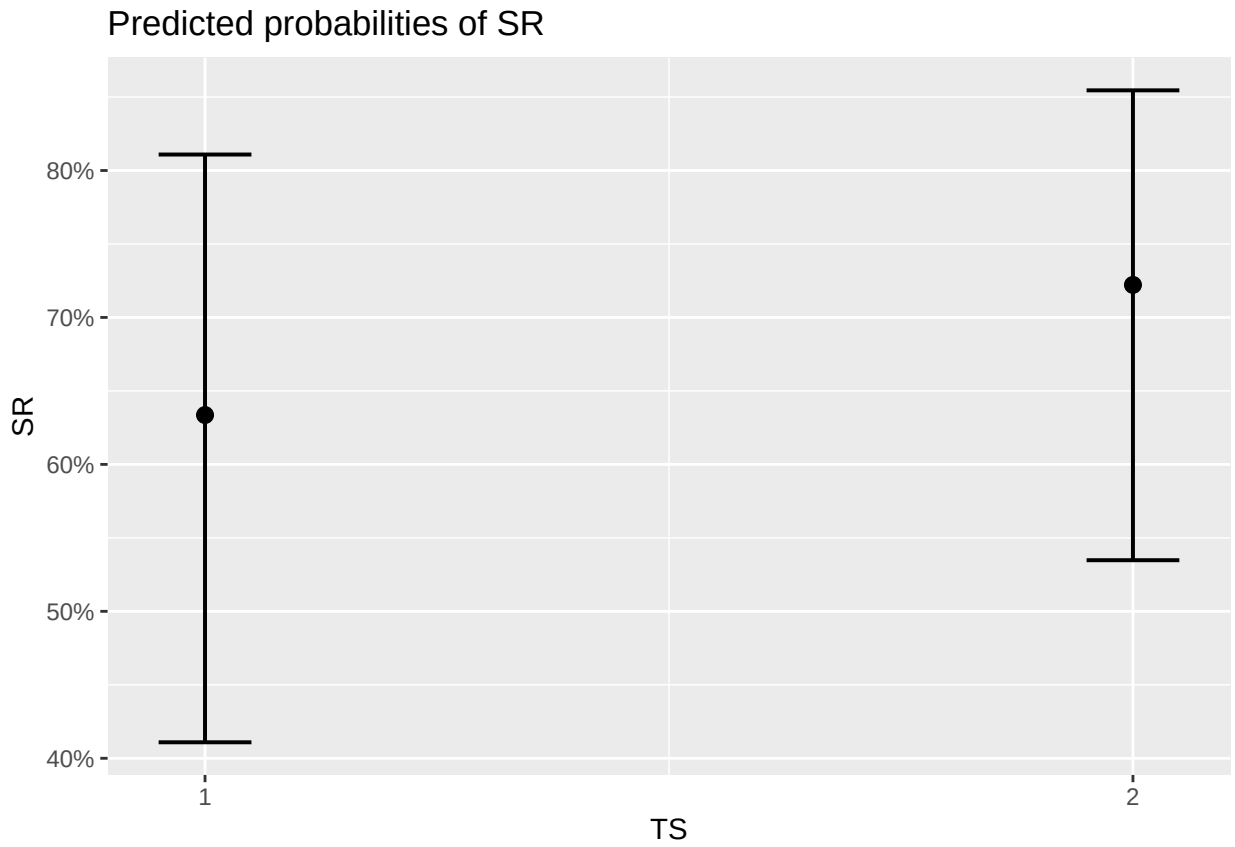

```
##
## $FA
```



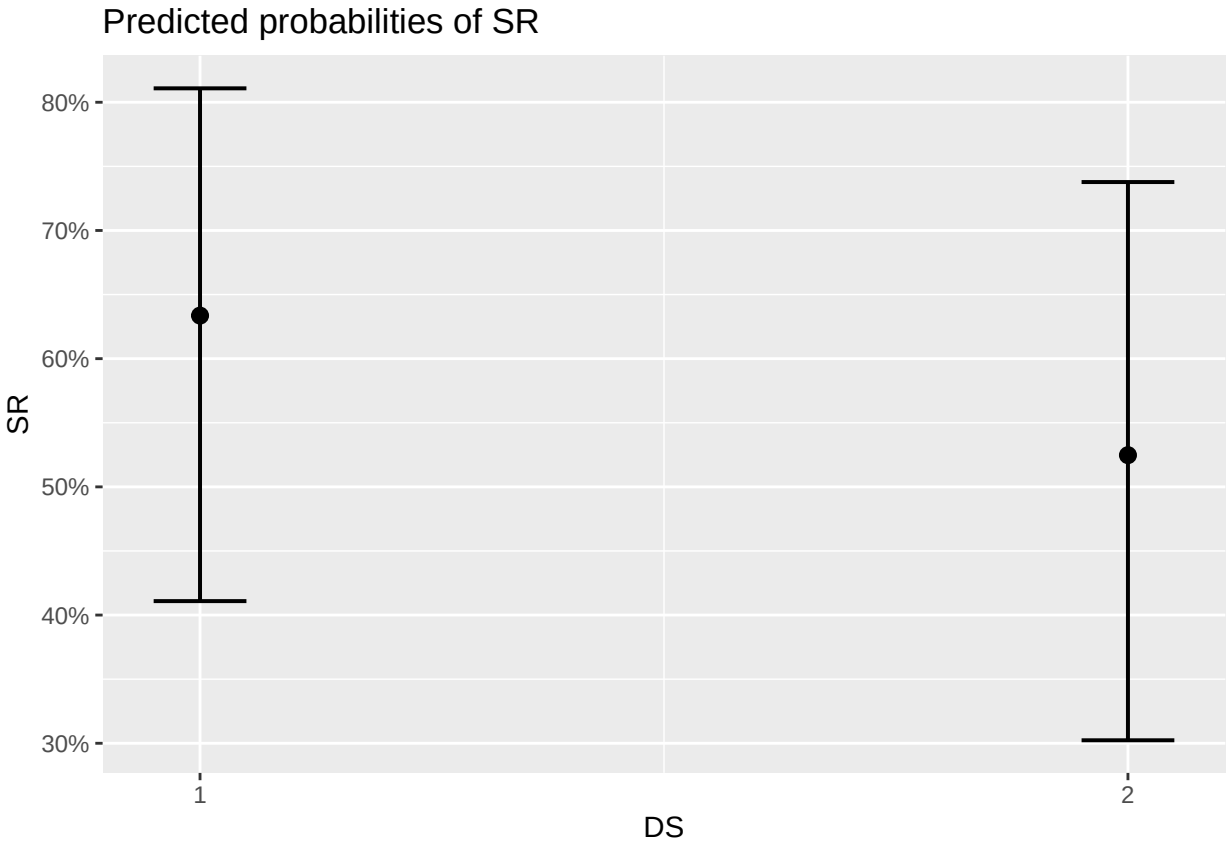

```
##
## $DWH
```




```
##
## $TS
```




```
##
## $DS
```


Predicted probabilities of SR
80%
70%
60%
50%
40%
30%
SR
1
2
DS

Comparing Models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ TA + H + RS + NP + FA + DWH + TS + DS
## Model 3: SR ~ FR + NASA + TA + E + AGR + CS + NT + OP + AV + EM + Task +
##     H + RS + WH + TWR + BF + NP + FA + AP + PR + DWH + DWR +
##     TS + DS
##   Resid. Df Resid. Dev Df Deviance  Pr(>Chi)
## 1       402     495.86
## 2       389     396.93 13   98.932 2.671e-15 ***
## 3       369     380.38 20   16.546    0.6822
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Forward Selection

```
## Stepwise Model Path
## Analysis of Deviance Table
##
## Initial Model:
## SR ~ 1
##
## Final Model:
## SR ~ NP + DS + H + FA + TA + TS + RS + DWH
##
##
##    Step Df  Deviance Resid. Df Resid. Dev      AIC
## 1                          402   495.8633 497.8633
## 2  + NP  2 48.162925       400   447.7004 453.7004
## 3  + DS  1 13.863718       399   433.8367 441.8367
## 4   + H  1  8.686935       398   425.1498 435.1498
## 5  + FA  5 15.202842       393   409.9469 429.9469
## 6  + TA  1  5.561957       392   404.3850 426.3850
## 7  + TS  1  2.613630       391   401.7713 425.7713
## 8  + RS  1  2.527397       390   399.2439 425.2439
## 9 + DWH  1  2.312633       389   396.9313 424.9313
```

Forward Selection model

```
##
## Call:
## glm(formula = SR ~ NP + DS + H + FA + TA + TS + RS + DWH, family = "binomial",
##     data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.9666  -0.7499  -0.4682   0.8009   2.4752
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  1.310782   0.729660   1.796  0.07243 .
## NP2         -1.029792   0.276937  -3.719  0.00020 ***
## NP3         -2.043547   0.369292  -5.534 3.14e-08 ***
## DS2         -0.448631   0.297825  -1.506  0.13198
## H            0.015209   0.006142   2.476  0.01329 *
## FA2         -0.242879   0.335335  -0.724  0.46889
## FA3         -0.084827   0.601628  -0.141  0.88787
## FA4          1.385549   0.507181   2.732  0.00630 **
## FA5          0.082085   0.792599   0.104  0.91751
## FA6          1.342090   0.509147   2.636  0.00839 **
## TA          -0.027886   0.013203  -2.112  0.03467 *
## TS2          0.407418   0.265909   1.532  0.12548
## RS2         -0.402941   0.255856  -1.575  0.11528
## DWH2        -0.578448   0.380622  -1.520  0.12857
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 495.86  on 402  degrees of freedom
## Residual deviance: 396.93  on 389  degrees of freedom
## AIC: 424.93
##
## Number of Fisher Scoring iterations: 4
```

Comparing Models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ TA + H + RS + NP + FA + DWH + TS + DS
## Model 3: SR ~ NP + DS + H + FA + TA + TS + RS + DWH
## Model 4: SR ~ FR + NASA + TA + E + AGR + CS + NT + OP + AV + EM + Task +
##     H + RS + WH + TWR + BF + NP + FA + AP + PR + DWH + DWR +
##     TS + DS
##   Resid. Df Resid. Dev Df Deviance  Pr(>Chi)
## 1       402     495.86
## 2       389     396.93 13   98.932 2.671e-15 ***
## 3       389     396.93  0    0.000
## 4       369     380.38 20   16.546    0.6822
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Step_wise method

```
## Stepwise Model Path
## Analysis of Deviance Table
##
## Initial Model:
## SR ~ 1
##
## Final Model:
## SR ~ NP + DS + H + FA + TA + TS + RS + DWH
##
##
##    Step Df  Deviance Resid. Df Resid. Dev      AIC
## 1                          402   495.8633 497.8633
## 2  + NP  2 48.162925       400   447.7004 453.7004
## 3  + DS  1 13.863718       399   433.8367 441.8367
## 4   + H  1  8.686935       398   425.1498 435.1498
## 5  + FA  5 15.202842       393   409.9469 429.9469
## 6  + TA  1  5.561957       392   404.3850 426.3850
## 7  + TS  1  2.613630       391   401.7713 425.7713
## 8  + RS  1  2.527397       390   399.2439 425.2439
## 9 + DWH  1  2.312633       389   396.9313 424.9313

##
## Call:
## glm(formula = SR ~ NP + DS + H + FA + TA + TS + RS + DWH, family = "binomial",
##     data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.9666  -0.7499  -0.4682   0.8009   2.4752
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  1.310782   0.729660   1.796  0.07243 .
## NP2         -1.029792   0.276937  -3.719  0.00020 ***
## NP3         -2.043547   0.369292  -5.534 3.14e-08 ***
## DS2         -0.448631   0.297825  -1.506  0.13198
## H            0.015209   0.006142   2.476  0.01329 *
## FA2         -0.242879   0.335335  -0.724  0.46889
## FA3         -0.084827   0.601628  -0.141  0.88787
## FA4          1.385549   0.507181   2.732  0.00630 **
## FA5          0.082085   0.792599   0.104  0.91751
## FA6          1.342090   0.509147   2.636  0.00839 **
## TA          -0.027886   0.013203  -2.112  0.03467 *
## TS2          0.407418   0.265909   1.532  0.12548
## RS2         -0.402941   0.255856  -1.575  0.11528
## DWH2        -0.578448   0.380622  -1.520  0.12857
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 495.86  on 402  degrees of freedom
```

```
## Residual deviance: 396.93  on 389  degrees of freedom
## AIC: 424.93
##
## Number of Fisher Scoring iterations: 4
```

Comparing models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ TA + H + RS + NP + FA + DWH + TS + DS
## Model 3: SR ~ NP + DS + H + FA + TA + TS + RS + DWH
## Model 4: SR ~ NP + DS + H + FA + TA + TS + RS + DWH
## Model 5: SR ~ FR + NASA + TA + E + AGR + CS + NT + OP + AV + EM + Task +
##     H + RS + WH + TWR + BF + NP + FA + AP + PR + DWH + DWR +
##     TS + DS
##   Resid. Df Resid. Dev Df Deviance  Pr(>Chi)
## 1       402     495.86
## 2       389     396.93 13   98.932 2.671e-15 ***
## 3       389     396.93  0    0.000
## 4       389     396.93  0    0.000
## 5       369     380.38 20   16.546    0.6822
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

-> -> -> ->

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-> -> -> -> ->