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  339
## 2 1   64
```

Null Model

```
##
## Call:
## glm(formula = SR ~ 1, family = "binomial", data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -0.5881  -0.5881  -0.5881  -0.5881   1.9184
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept)  -1.6671     0.1363  -12.23   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 352.78  on 402  degrees of freedom
## Residual deviance: 352.78  on 402  degrees of freedom
## AIC: 354.78
##
## Number of Fisher Scoring iterations: 3
```

Logistic Regression: Full MOdel

```
##
## Call:
## glm(formula = SR ~ ., family = "binomial", data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.9345  -0.5470  -0.2972  -0.1551   3.1401
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) -2.308176   2.440987  -0.946  0.34436
## NASA        -0.005732   0.034753  -0.165  0.86898
## TA          -0.028296   0.029292  -0.966  0.33405
## E           -0.286698   0.088980  -3.222  0.00127 **
## AGR          0.086973   0.106917   0.813  0.41595
## CS           0.093118   0.114960   0.810  0.41794
## NT           0.040994   0.117451   0.349  0.72707
## OP           0.097480   0.100215   0.973  0.33070
## AV           0.061846   0.035435   1.745  0.08093 .
## EM           0.037351   0.045143   0.827  0.40801
## Task         0.070407   0.052609   1.338  0.18080
## H            0.020605   0.009006   2.288  0.02214 *
## RS2         -0.419614   0.344160  -1.219  0.22275
## WH2         -0.286907   0.655227  -0.438  0.66148
## TWR          0.008781   0.012363   0.710  0.47755
## BF2          0.820900   0.376846   2.178  0.02938 *
## NP2         -1.128400   0.372561  -3.029  0.00246 **
## NP3         -2.554616   0.580767  -4.399 1.09e-05 ***
## FA2         -0.401821   0.491250  -0.818  0.41338
## FA3          1.199367   0.671414   1.786  0.07405 .
## FA4          1.410402   0.605758   2.328  0.01989 *
## FA5         -0.168054   1.216016  -0.138  0.89008
## FA6          1.543775   0.570873   2.704  0.00685 **
## AP          -0.290568   0.468572  -0.620  0.53518
## PR2         -1.408316   0.670934  -2.099  0.03581 *
## PR3         -1.987596   0.696207  -2.855  0.00431 **
## PR4         -1.410743   0.636986  -2.215  0.02678 *
## PR5         -1.758544   0.663901  -2.649  0.00808 **
## DWH2         0.123595   0.506752   0.244  0.80731
## DWR         -0.006374   0.010567  -0.603  0.54638
## TS2          0.112735   0.360461   0.313  0.75447
## DS2         -0.623196   0.415976  -1.498  0.13409
## FR2         -0.467398   0.499643  -0.935  0.34955
## FR3         -0.673010   0.541633  -1.243  0.21403
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 352.78  on 402  degrees of freedom
## Residual deviance: 259.99  on 369  degrees of freedom
## AIC: 327.99
```

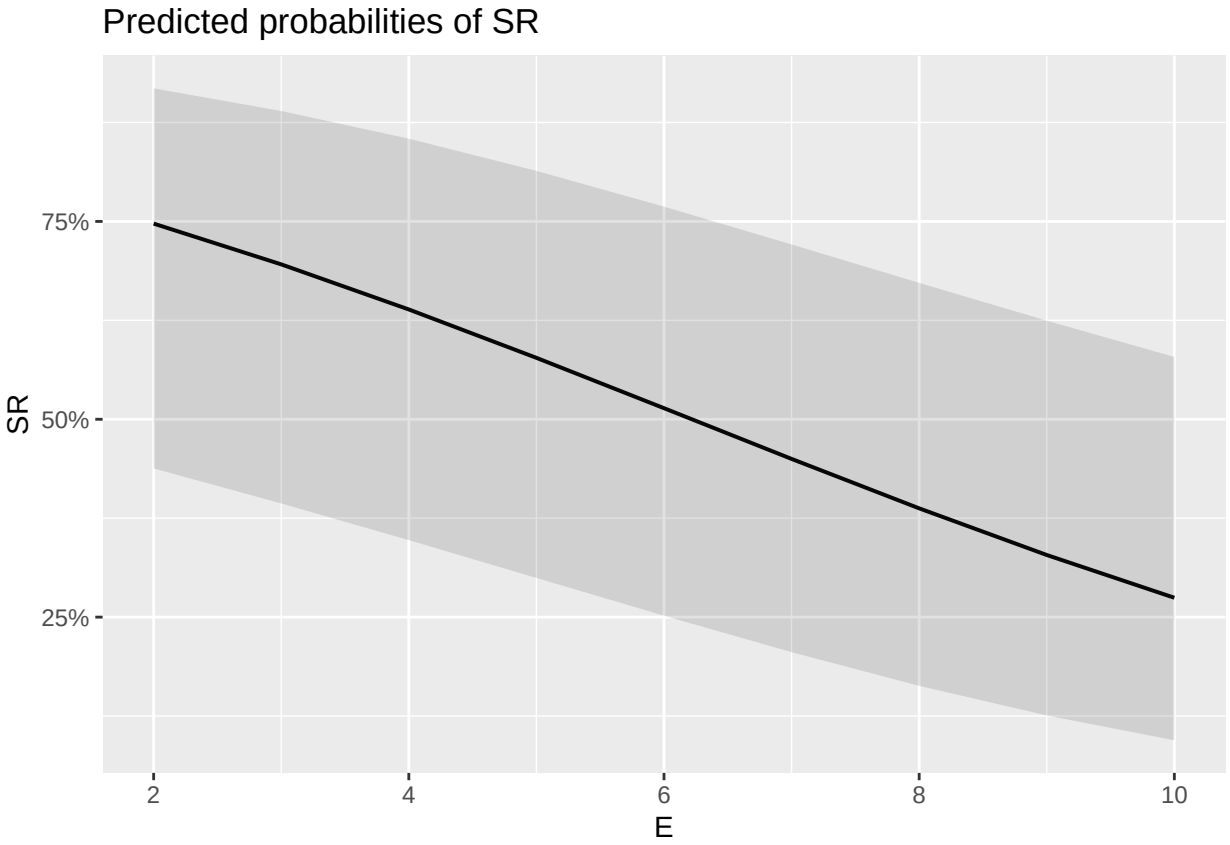
```
##
## Number of Fisher Scoring iterations: 6
```

Backward Elimination Model selection

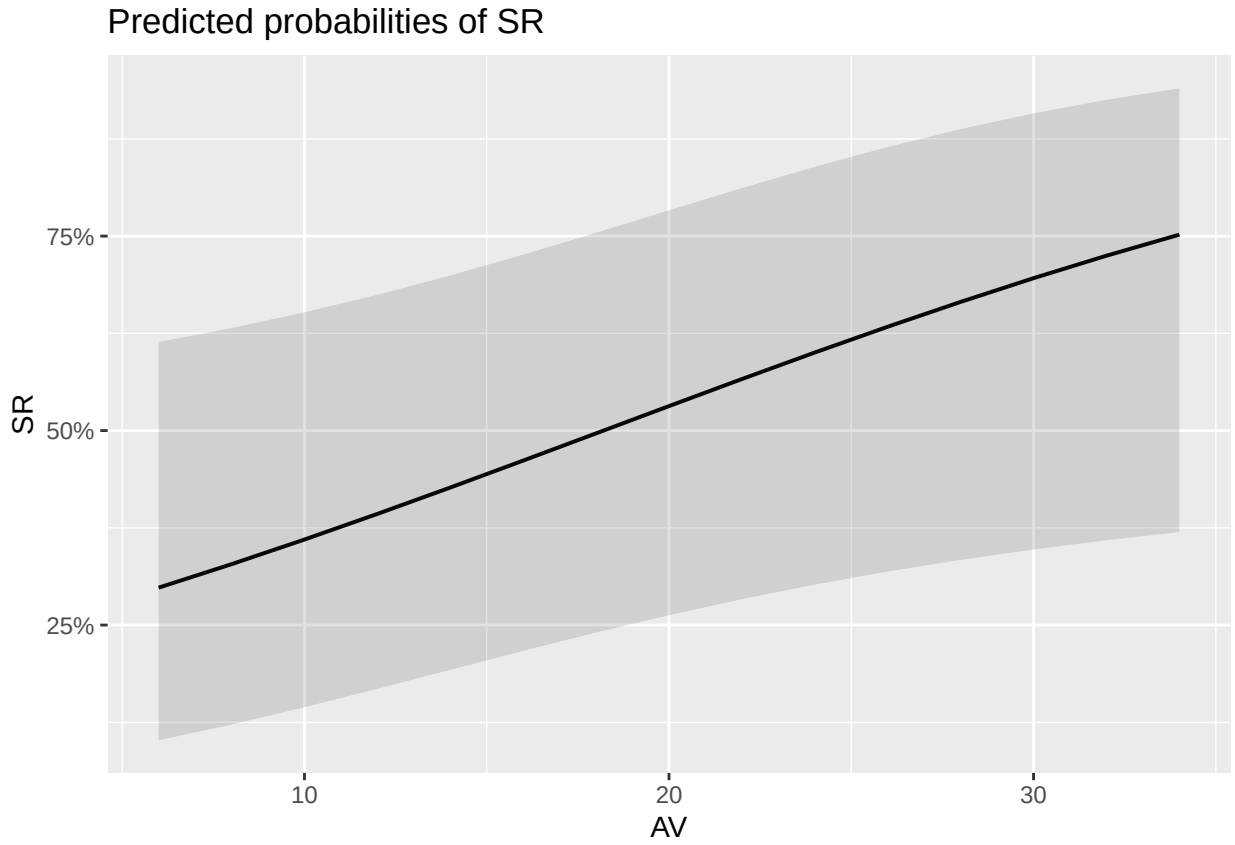
```
## Stepwise Model Path
## Analysis of Deviance Table
##
## Initial Model:
## SR ~ NASA + TA + E + AGR + CS + NT + OP + AV + EM + Task + H +
##     RS + WH + TWR + BF + NP + FA + AP + PR + DWH + DWR + TS +
##     DS + FR
##
## Final Model:
## SR ~ E + AV + Task + H + BF + NP + FA + PR + DS
##
##
##      Step Df   Deviance Resid. Df Resid. Dev      AIC
## 1                            369   259.9920 327.9920
## 2    - FR  2 1.56728781       371   261.5593 325.5593
## 3  - NASA  1 0.01062875       372   261.5699 323.5699
## 4   - DWH  1 0.02961136       373   261.5995 321.5995
## 5    - TS  1 0.08148122       374   261.6810 319.6810
## 6    - NT  1 0.17232826       375   261.8533 317.8533
## 7    - WH  1 0.17847017       376   262.0318 316.0318
## 8   - DWR  1 0.32688846       377   262.3587 314.3587
## 9   - TWR  1 0.39774820       378   262.7564 312.7564
## 10  - AGR  1 0.56541374       379   263.3219 311.3219
## 11   - AP  1 0.63780034       380   263.9597 309.9597
## 12   - CS  1 0.72324350       381   264.6829 308.6829
## 13   - TA  1 0.91157317       382   265.5945 307.5945
## 14   - EM  1 0.33667056       383   265.9311 305.9311
## 15   - RS  1 0.91239893       384   266.8435 304.8435
## 16   - OP  1 1.46904082       385   268.3126 304.3126
```

Backward Elimination Model

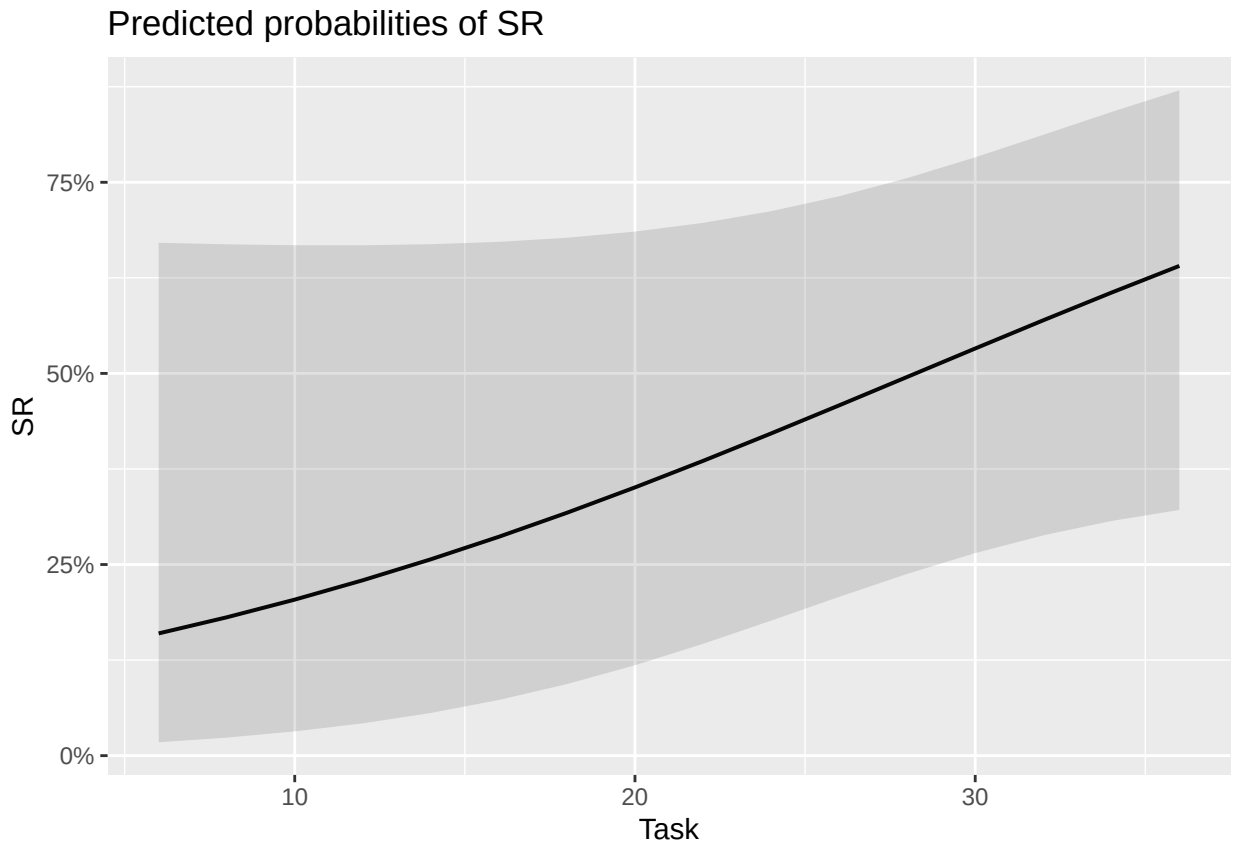
```
##
## Call:
## glm(formula = SR ~ E + AV + Task + H + BF + NP + FA + PR + DS,
##     family = "binomial", data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.7456  -0.5416  -0.3385  -0.1819   3.0842
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) -2.349521   1.528009  -1.538  0.12414
## E           -0.257018   0.081684  -3.146  0.00165 **
## AV           0.070176   0.034171   2.054  0.04001 *
## Task         0.074570   0.046684   1.597  0.11019
## H            0.018070   0.007472   2.418  0.01560 *
## BF2          0.715502   0.334340   2.140  0.03235 *
## NP2         -1.030998   0.353445  -2.917  0.00353 **
## NP3         -2.346719   0.530585  -4.423 9.74e-06 ***
## FA2         -0.370379   0.466132  -0.795  0.42686
## FA3          1.243962   0.636284   1.955  0.05058 .
## FA4          1.212161   0.580089   2.090  0.03665 *
## FA5          0.064775   1.157286   0.056  0.95536
## FA6          1.541473   0.529097   2.913  0.00358 **
## PR2         -1.431195   0.640805  -2.233  0.02552 *
## PR3         -1.822639   0.662316  -2.752  0.00592 **
## PR4         -1.270992   0.606813  -2.095  0.03621 *
## PR5         -1.663969   0.623994  -2.667  0.00766 **
## DS2         -0.564842   0.333251  -1.695  0.09009 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 352.78  on 402  degrees of freedom
## Residual deviance: 268.31  on 385  degrees of freedom
## AIC: 304.31
##
## Number of Fisher Scoring iterations: 6

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

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

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

## $E
```



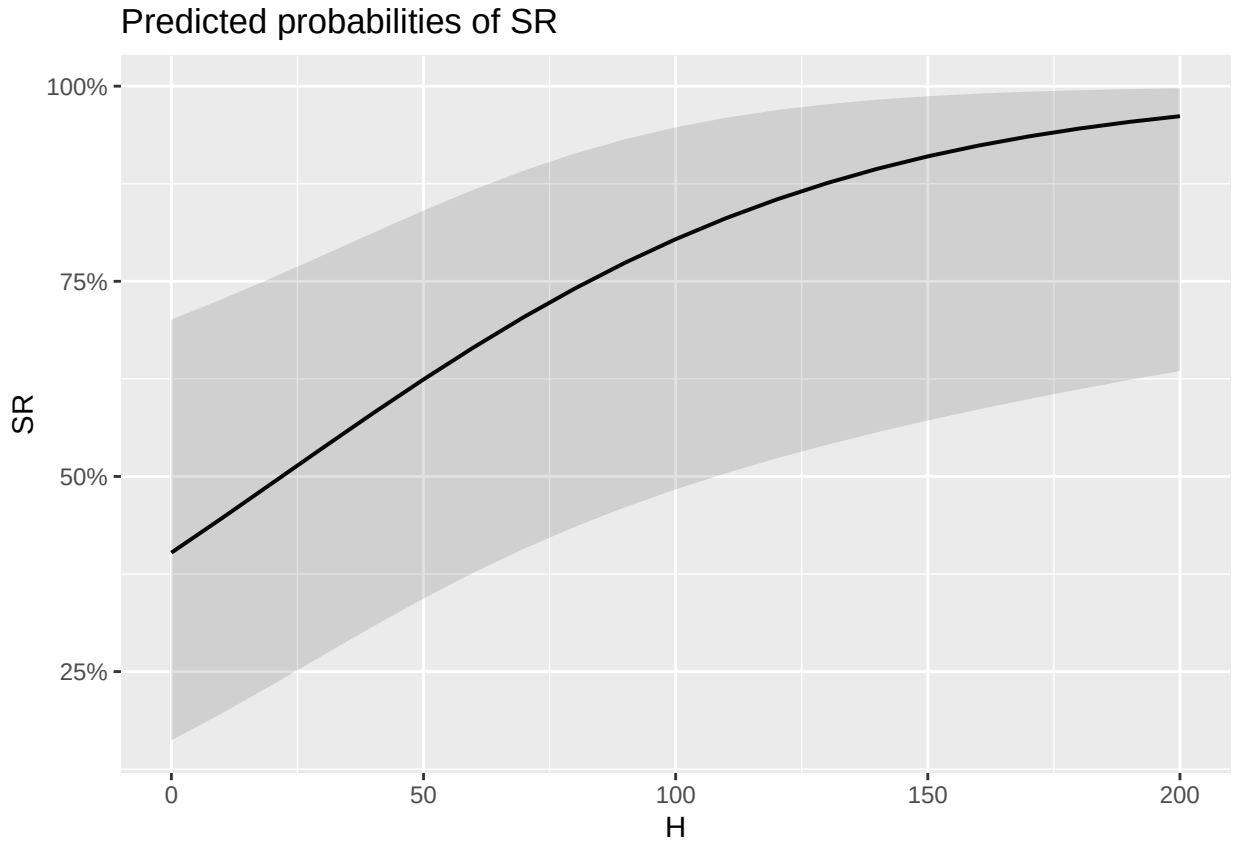

```
##
## $AV
```



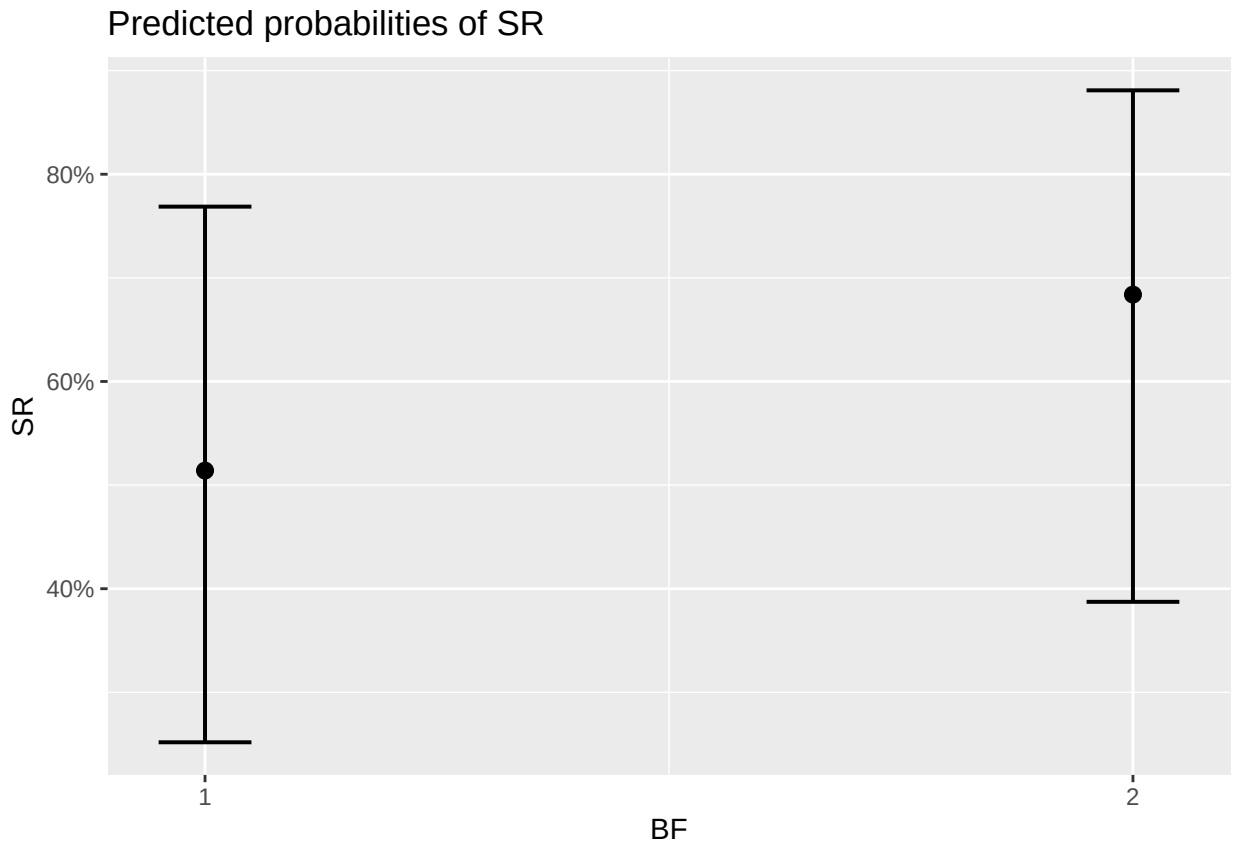

```
##
## $Task
```



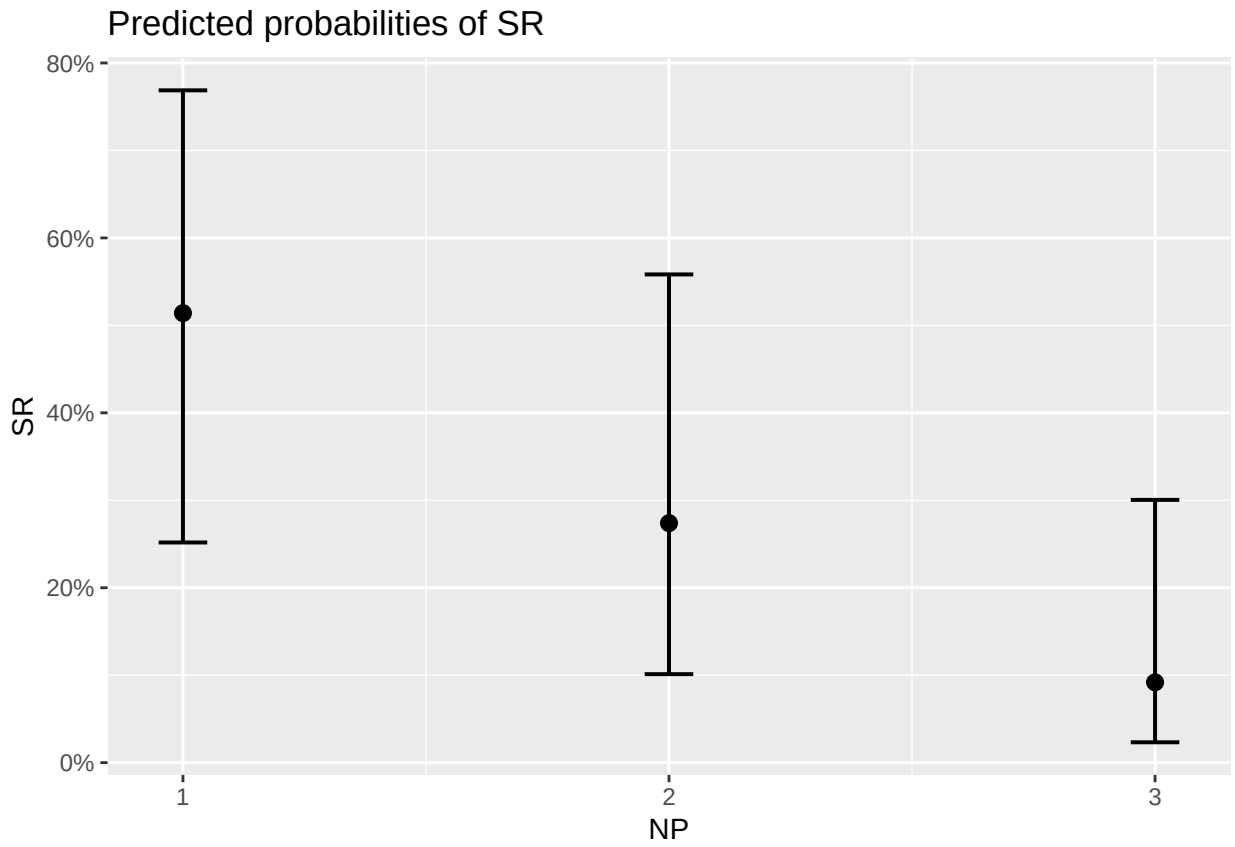

```
##
## $H
```


Predicted probabilities of SR
100%
75%
50%
25%
SR
0
50
100
150
200
H

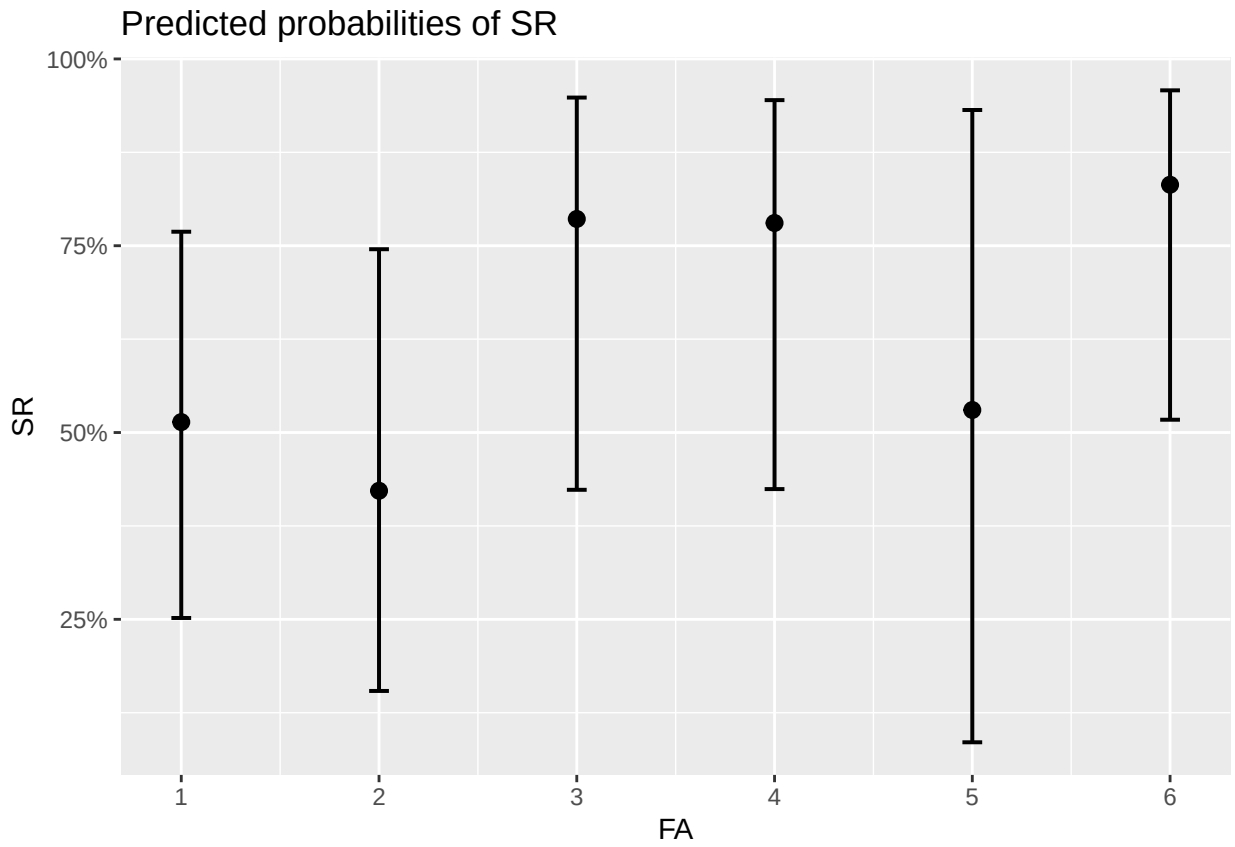
```
##
## $BF
```



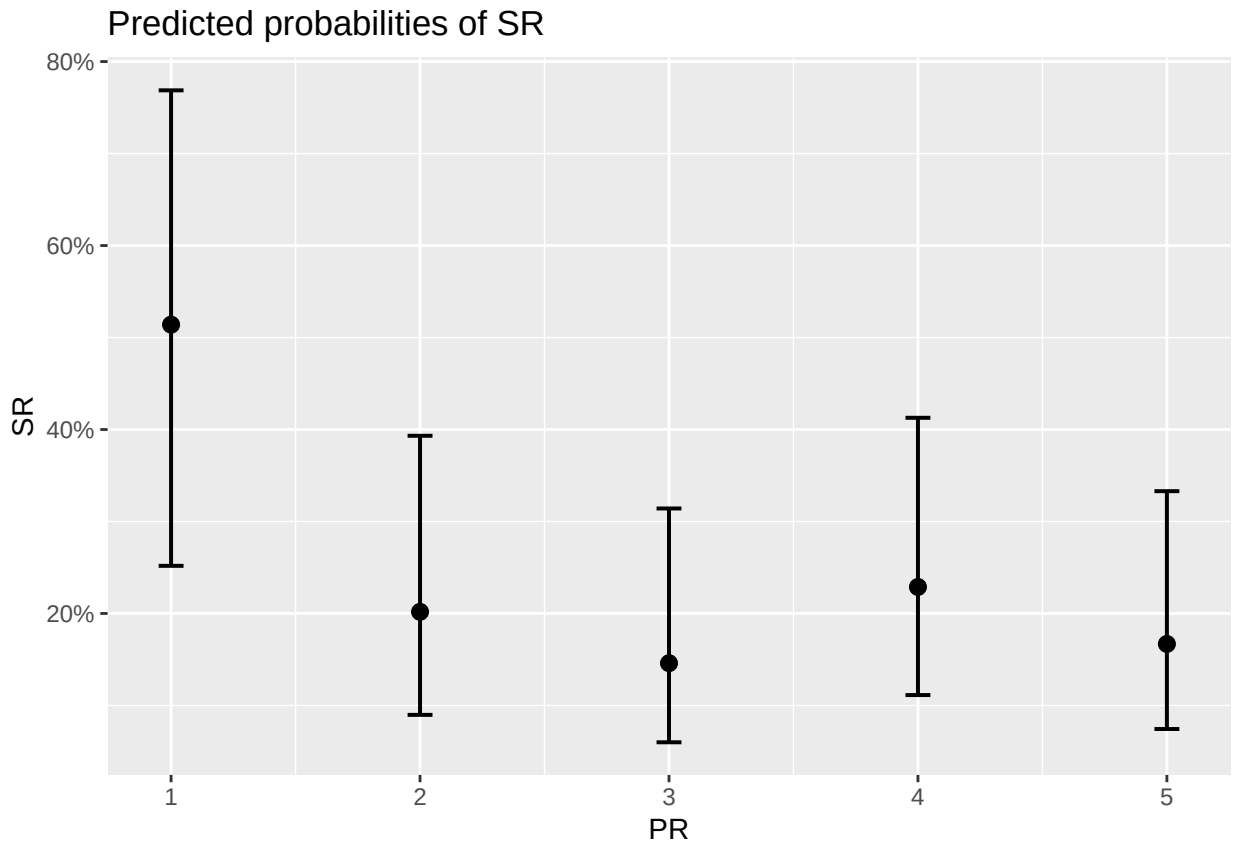

```
##
## $NP
```



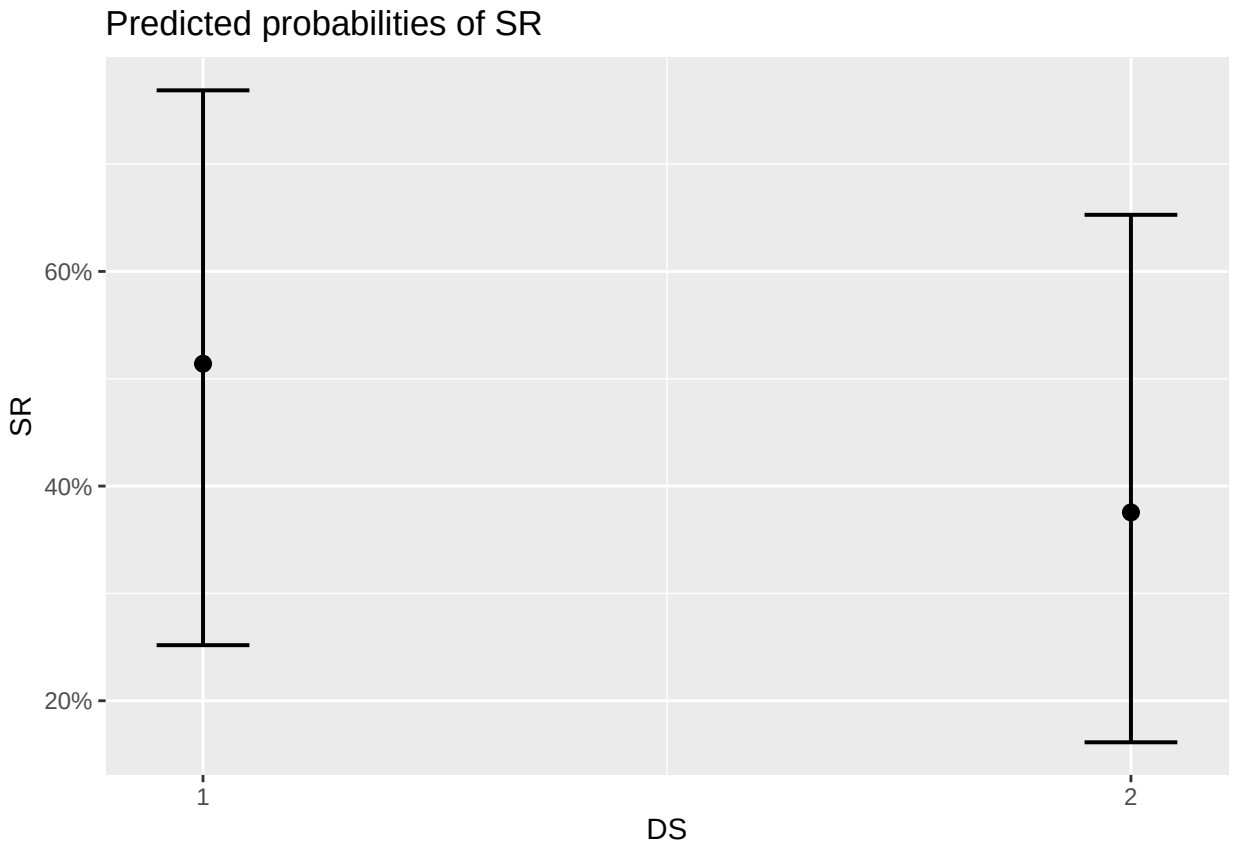

```
##
## $FA
```




```
##
## $PR
```




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


Predicted probabilities of SR
60%
40%
20%
SR
1
2
DS

Comparing Models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ E + AV + Task + H + BF + NP + FA + PR + DS
## Model 3: SR ~ NASA + TA + E + AGR + CS + NT + OP + AV + EM + Task + H +
##     RS + WH + TWR + BF + NP + FA + AP + PR + DWH + DWR + TS +
##     DS + FR
##   Resid. Df Resid. Dev Df Deviance  Pr(>Chi)
## 1       402     352.78
## 2       385     268.31 17   84.465 6.112e-11 ***
## 3       369     259.99 16    8.321    0.9387
## ---
## 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 + FA + H + E + Task + BF + DS + AV + PR
##
##
##      Step Df  Deviance Resid. Df Resid. Dev      AIC
## 1                            402   352.7778 354.7778
## 2    + NP  2 31.870206       400   320.9076 326.9076
## 3    + FA  5 17.622472       395   303.2851 319.2851
## 4     + H  1  8.754536       394   294.5305 312.5305
## 5     + E  1  6.406705       393   288.1238 308.1238
## 6  + Task  1  3.484323       392   284.6395 306.6395
## 7    + BF  1  2.804220       391   281.8353 305.8353
## 8    + DS  1  2.668700       390   279.1666 305.1666
## 9    + AV  1  2.468630       389   276.6980 304.6980
## 10   + PR  4  8.385385       385   268.3126 304.3126
```

Forward Selection model

```
##
## Call:
## glm(formula = SR ~ NP + FA + H + E + Task + BF + DS + AV + PR,
##     family = "binomial", data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.7456  -0.5416  -0.3385  -0.1819   3.0842
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) -2.349521   1.528009  -1.538  0.12414
## NP2         -1.030998   0.353445  -2.917  0.00353 **
## NP3         -2.346719   0.530585  -4.423 9.74e-06 ***
## FA2         -0.370379   0.466132  -0.795  0.42686
## FA3          1.243962   0.636284   1.955  0.05058 .
## FA4          1.212161   0.580089   2.090  0.03665 *
## FA5          0.064775   1.157286   0.056  0.95536
## FA6          1.541473   0.529097   2.913  0.00358 **
## H            0.018070   0.007472   2.418  0.01560 *
## E           -0.257018   0.081684  -3.146  0.00165 **
## Task         0.074570   0.046684   1.597  0.11019
## BF2          0.715502   0.334340   2.140  0.03235 *
## DS2         -0.564842   0.333251  -1.695  0.09009 .
## AV           0.070176   0.034171   2.054  0.04001 *
## PR2         -1.431195   0.640805  -2.233  0.02552 *
## PR3         -1.822639   0.662316  -2.752  0.00592 **
## PR4         -1.270992   0.606813  -2.095  0.03621 *
## PR5         -1.663969   0.623994  -2.667  0.00766 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 352.78  on 402  degrees of freedom
## Residual deviance: 268.31  on 385  degrees of freedom
## AIC: 304.31
##
## Number of Fisher Scoring iterations: 6
```

Comparing Models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ E + AV + Task + H + BF + NP + FA + PR + DS
## Model 3: SR ~ NP + FA + H + E + Task + BF + DS + AV + PR
## Model 4: SR ~ NASA + TA + E + AGR + CS + NT + OP + AV + EM + Task + H +
##     RS + WH + TWR + BF + NP + FA + AP + PR + DWH + DWR + TS +
##     DS + FR
##   Resid. Df Resid. Dev Df Deviance  Pr(>Chi)
## 1       402     352.78
## 2       385     268.31 17   84.465 6.112e-11 ***
## 3       385     268.31  0    0.000
## 4       369     259.99 16    8.321    0.9387
## ---
## 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 + FA + H + E + Task + BF + DS + AV + PR
##
##
##      Step Df  Deviance Resid. Df Resid. Dev      AIC
## 1                           402   352.7778 354.7778
## 2    + NP  2 31.870206       400   320.9076 326.9076
## 3    + FA  5 17.622472       395   303.2851 319.2851
## 4     + H  1  8.754536       394   294.5305 312.5305
## 5     + E  1  6.406705       393   288.1238 308.1238
## 6  + Task  1  3.484323       392   284.6395 306.6395
## 7    + BF  1  2.804220       391   281.8353 305.8353
## 8    + DS  1  2.668700       390   279.1666 305.1666
## 9    + AV  1  2.468630       389   276.6980 304.6980
## 10   + PR  4  8.385385       385   268.3126 304.3126

##
## Call:
## glm(formula = SR ~ NP + FA + H + E + Task + BF + DS + AV + PR,
##     family = "binomial", data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.7456  -0.5416  -0.3385  -0.1819   3.0842
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) -2.349521   1.528009  -1.538  0.12414
## NP2         -1.030998   0.353445  -2.917  0.00353 **
## NP3         -2.346719   0.530585  -4.423 9.74e-06 ***
## FA2         -0.370379   0.466132  -0.795  0.42686
## FA3          1.243962   0.636284   1.955  0.05058 .
## FA4          1.212161   0.580089   2.090  0.03665 *
## FA5          0.064775   1.157286   0.056  0.95536
## FA6          1.541473   0.529097   2.913  0.00358 **
## H            0.018070   0.007472   2.418  0.01560 *
## E           -0.257018   0.081684  -3.146  0.00165 **
## Task         0.074570   0.046684   1.597  0.11019
## BF2          0.715502   0.334340   2.140  0.03235 *
## DS2         -0.564842   0.333251  -1.695  0.09009 .
## AV           0.070176   0.034171   2.054  0.04001 *
## PR2         -1.431195   0.640805  -2.233  0.02552 *
## PR3         -1.822639   0.662316  -2.752  0.00592 **
## PR4         -1.270992   0.606813  -2.095  0.03621 *
## PR5         -1.663969   0.623994  -2.667  0.00766 **
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 352.78  on 402  degrees of freedom
## Residual deviance: 268.31  on 385  degrees of freedom
## AIC: 304.31
##
## Number of Fisher Scoring iterations: 6
```

Comparing models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ E + AV + Task + H + BF + NP + FA + PR + DS
## Model 3: SR ~ NP + FA + H + E + Task + BF + DS + AV + PR
## Model 4: SR ~ NP + FA + H + E + Task + BF + DS + AV + PR
## Model 5: SR ~ NASA + TA + E + AGR + CS + NT + OP + AV + EM + Task + H +
##     RS + WH + TWR + BF + NP + FA + AP + PR + DWH + DWR + TS +
##     DS + FR
##   Resid. Df Resid. Dev Df Deviance  Pr(>Chi)
## 1       402     352.78
## 2       385     268.31 17   84.465 6.112e-11 ***
## 3       385     268.31  0    0.000
## 4       385     268.31  0    0.000
## 5       369     259.99 16    8.321    0.9387
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

-> -> -> ->

-> -> -> -> ->

-> -> -> -> -> -> -> ->

-> -> -> -> ->