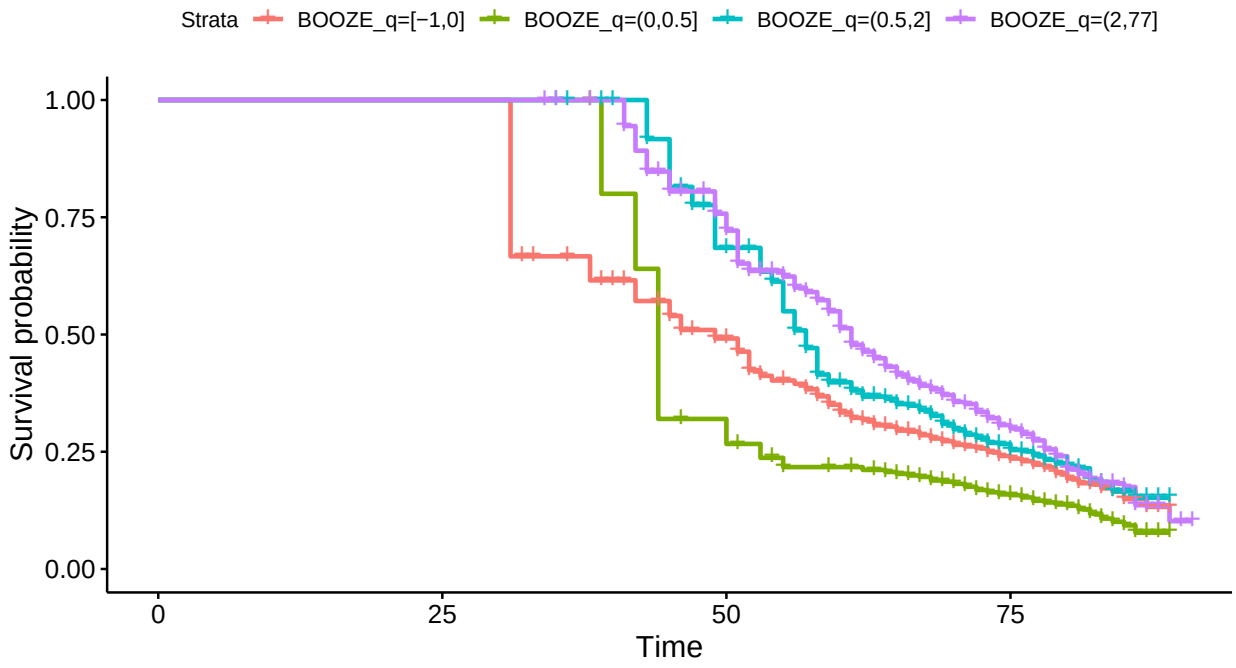
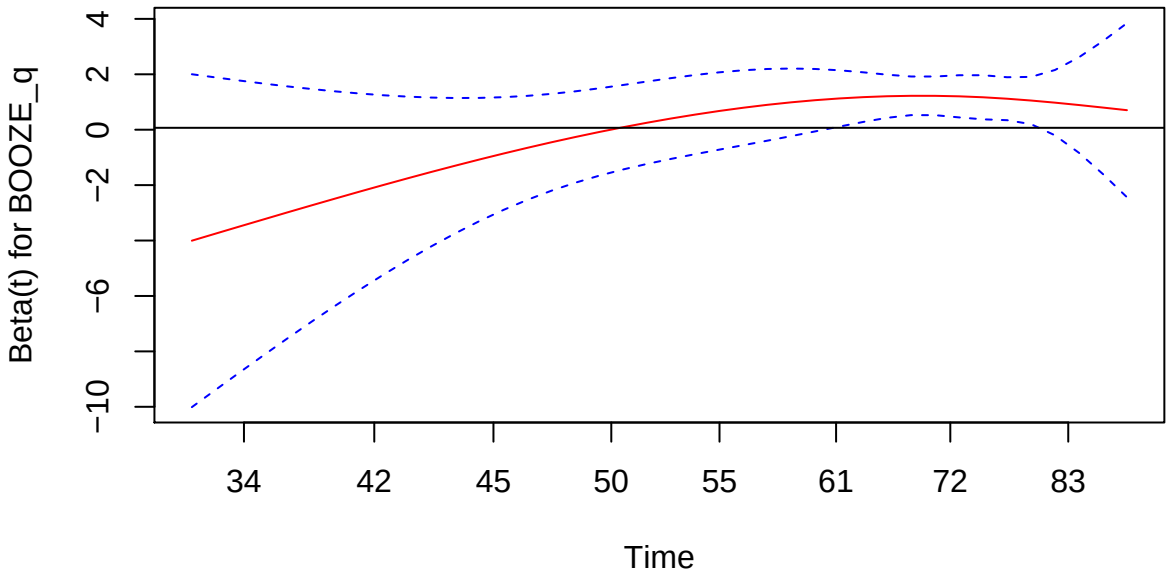
R Notebook

categorical BOOZE_q



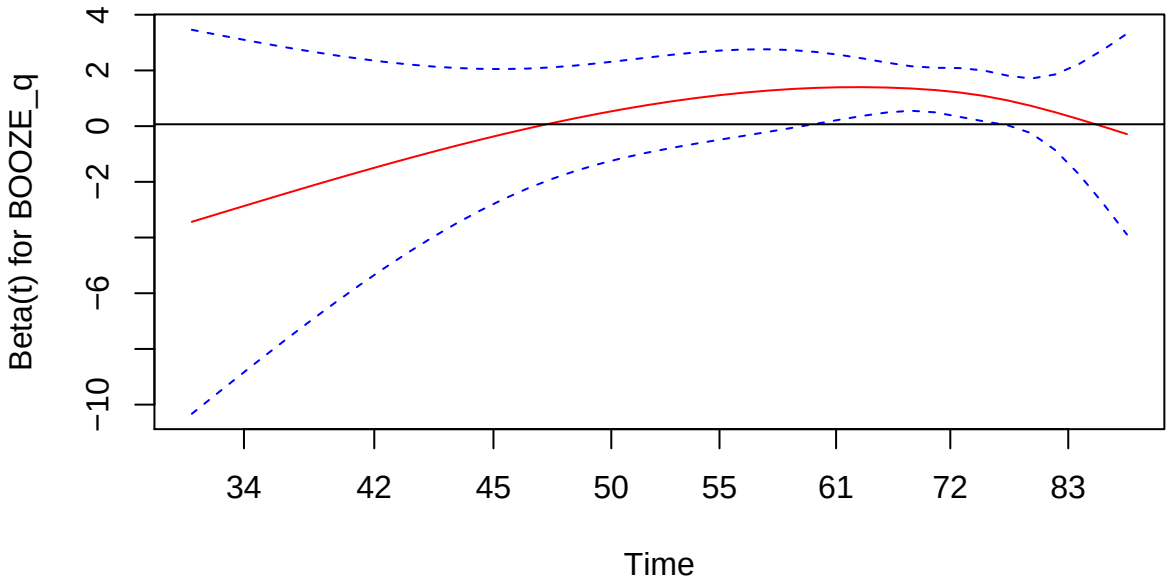
~ BOOZE_q

```
## Call:
## coxph(formula = Surv(AGEYRS, AGEDIE, cancer_death) ~ BOOZE_q,
##     data = data)
##
##   n= 2110, number of events= 556
##
##                    coef exp(coef) se(coef)     z Pr(>|z|)
## BOOZE_q(0,0.5] 0.06886   1.07129  0.15200 0.453 0.650510
## BOOZE_q(0.5,2] 0.22020   1.24632  0.12571 1.752 0.079843 .
## BOOZE_q(2,77]  0.34785   1.41603  0.10015 3.473 0.000514 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##                exp(coef) exp(-coef) lower .95 upper .95
## BOOZE_q(0,0.5]     1.071     0.9335    0.7953     1.443
## BOOZE_q(0.5,2]     1.246     0.8024    0.9741     1.595
## BOOZE_q(2,77]      1.416     0.7062    1.1636     1.723
##
## Concordance= 0.545  (se = 0.012 )
## Likelihood ratio test= 12.58  on 3 df,   p=0.006
## Wald test            = 12.77  on 3 df,   p=0.005
## Score (logrank) test = 12.87  on 3 df,   p=0.005

##         chisq df   p
## BOOZE_q  4.66  3 0.2
## GLOBAL   4.66  3 0.2
```



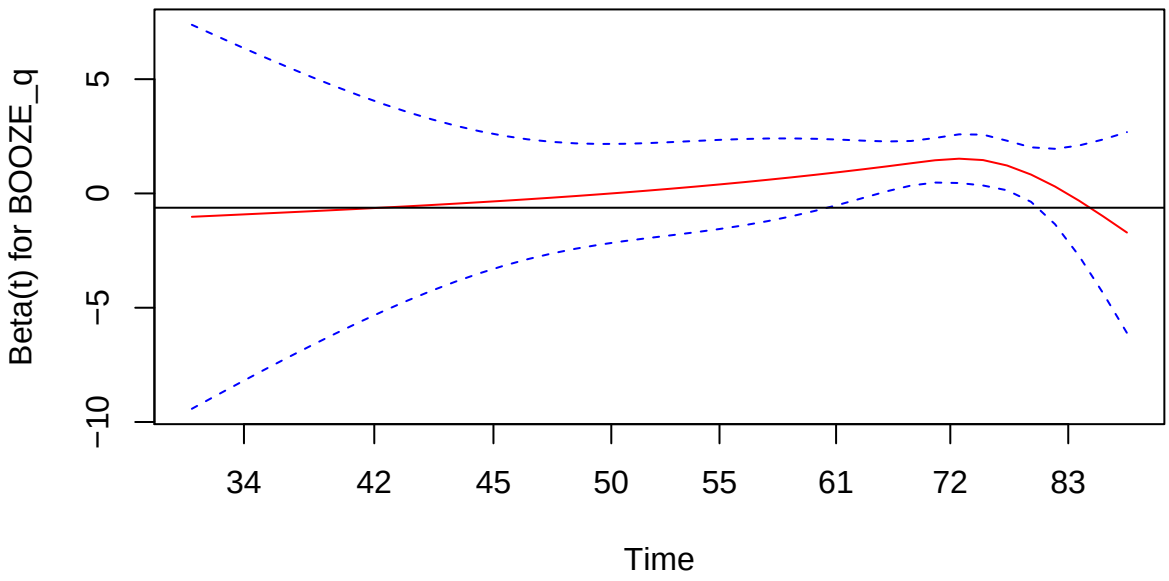
~ BOOZE_q + SEX

```
## Call:
## coxph(formula = Surv(AGEYRS, AGEDIE, cancer_death) ~ BOOZE_q +
##     SEX, data = data)
##
##   n= 2110, number of events= 556
##
##                     coef exp(coef) se(coef)      z Pr(>|z|)
## BOOZE_q(0,0.5]  0.06697   1.06926  0.15201  0.441  0.65954
## BOOZE_q(0.5,2]  0.20378   1.22603  0.12635  1.613  0.10678
## BOOZE_q(2,77]   0.31373   1.36852  0.10363  3.028  0.00247 **
## SEX            -0.11385   0.89239  0.09004 -1.265  0.20604
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##                exp(coef) exp(-coef) lower .95 upper .95
## BOOZE_q(0,0.5]    1.0693     0.9352    0.7938     1.440
## BOOZE_q(0.5,2]    1.2260     0.8156    0.9571     1.571
## BOOZE_q(2,77]     1.3685     0.7307    1.1170     1.677
## SEX               0.8924     1.1206    0.7480     1.065
##
## Concordance= 0.555  (se = 0.013 )
## Likelihood ratio test= 14.18  on 4 df,   p=0.007
## Wald test            = 14.34  on 4 df,   p=0.006
## Score (logrank) test = 14.45  on 4 df,   p=0.006

##         chisq df       p
## BOOZE_q   4.6  3 0.20340
## SEX      14.3  1 0.00015
## GLOBAL   16.4  4 0.00258
```


Beta(t) for BOOZE_q
4
2
0
−2
−6
−10
34
42
45
50
55
61
72
83
Time

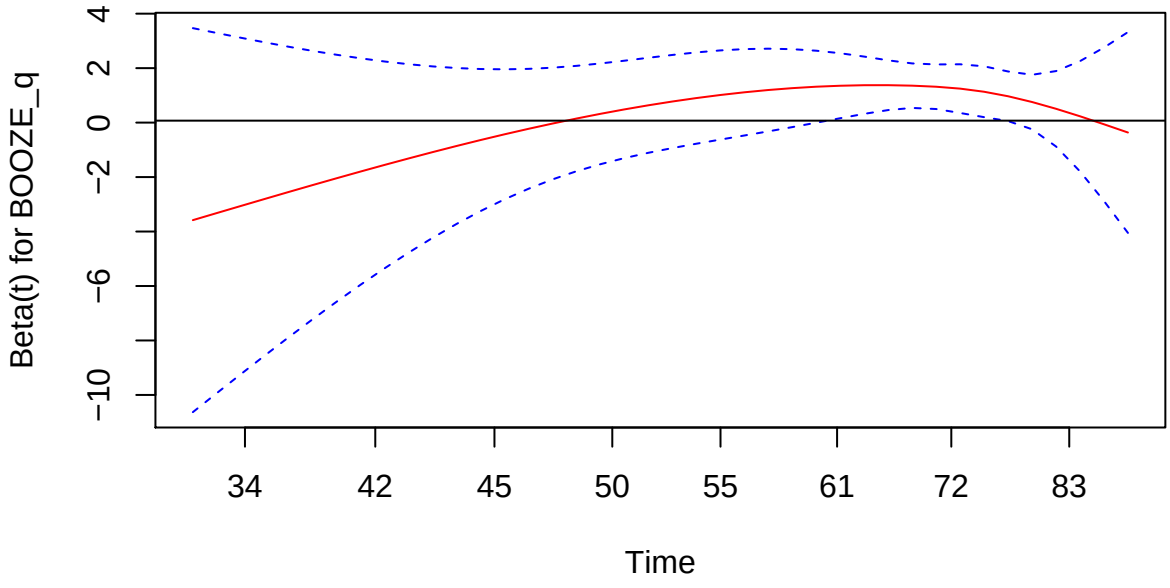
~ BOOZE_q + SEX + BOOZE_q * SEX

```
## Call:
## coxph(formula = Surv(AGEYRS, AGEDIE, cancer_death) ~ BOOZE_q +
##     SEX + BOOZE_q * SEX, data = data)
##
##   n= 2110, number of events= 556
##
##                        coef exp(coef) se(coef)      z Pr(>|z|)
## BOOZE_q(0,0.5]     -0.6254    0.5351   0.4982 -1.255  0.20940
## BOOZE_q(0.5,2]     -0.5305    0.5883   0.3850 -1.378  0.16823
## BOOZE_q(2,77]      -0.2474    0.7808   0.3051 -0.811  0.41729
## SEX                -0.3512    0.7038   0.1305 -2.691  0.00713 **
## BOOZE_q(0,0.5]:SEX  0.4562    1.5780   0.3063  1.489  0.13647
## BOOZE_q(0.5,2]:SEX  0.5064    1.6593   0.2513  2.015  0.04388 *
## BOOZE_q(2,77]:SEX   0.4033    1.4967   0.2153  1.873  0.06103 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##                    exp(coef) exp(-coef) lower .95 upper .95
## BOOZE_q(0,0.5]        0.5351     1.8689    0.2015     1.421
## BOOZE_q(0.5,2]        0.5883     1.6999    0.2766     1.251
## BOOZE_q(2,77]         0.7808     1.2808    0.4294     1.420
## SEX                   0.7038     1.4208    0.5449     0.909
## BOOZE_q(0,0.5]:SEX    1.5780     0.6337    0.8657     2.876
## BOOZE_q(0.5,2]:SEX    1.6593     0.6027    1.0140     2.715
## BOOZE_q(2,77]:SEX     1.4967     0.6681    0.9815     2.282
##
## Concordance= 0.561  (se = 0.013 )
## Likelihood ratio test= 20.6  on 7 df,   p=0.004
## Wald test            = 19.78  on 7 df,   p=0.006
## Score (logrank) test = 20.08  on 7 df,   p=0.005

##             chisq df       p
## BOOZE_q      4.67  3 0.19759
## SEX         12.34  1 0.00044
## BOOZE_q:SEX  6.67  3 0.08324
## GLOBAL      15.61  7 0.02890
```


Beta(t) for BOOZE_q
5
0
−5
−10
34
42
45
50
55
61
72
83
Time

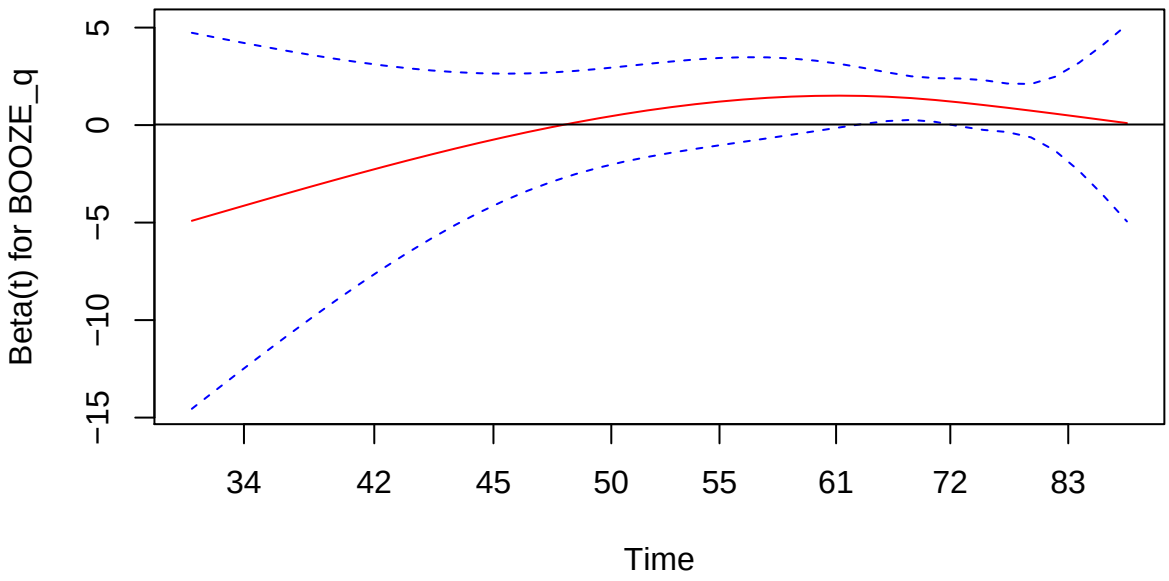
~ BOOZE_q, stratify by SEX

```
## Call:
## coxph(formula = Surv(AGEYRS, AGEDIE, cancer_death) ~ BOOZE_q +
##     strata(SEX), data = data)
##
##   n= 2110, number of events= 556
##
##                    coef exp(coef) se(coef)     z Pr(>|z|)
## BOOZE_q(0,0.5] 0.07178   1.07441  0.15213 0.472  0.63706
## BOOZE_q(0.5,2] 0.19041   1.20974  0.12654 1.505  0.13241
## BOOZE_q(2,77]  0.30784   1.36049  0.10331 2.980  0.00289 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##                exp(coef) exp(-coef) lower .95 upper .95
## BOOZE_q(0,0.5]     1.074     0.9307    0.7974     1.448
## BOOZE_q(0.5,2]     1.210     0.8266    0.9440     1.550
## BOOZE_q(2,77]      1.360     0.7350    1.1111     1.666
##
## Concordance= 0.537  (se = 0.013 )
## Likelihood ratio test= 9.18  on 3 df,   p=0.03
## Wald test            = 9.27  on 3 df,   p=0.03
## Score (logrank) test = 9.32  on 3 df,   p=0.03

##         chisq df    p
## BOOZE_q  2.31  3 0.51
## GLOBAL   2.31  3 0.51
```



~ BOOZE_q + SEX + RACE + GRADES + MARRY + SIZE + AVGSMK + SMSA + URBAN

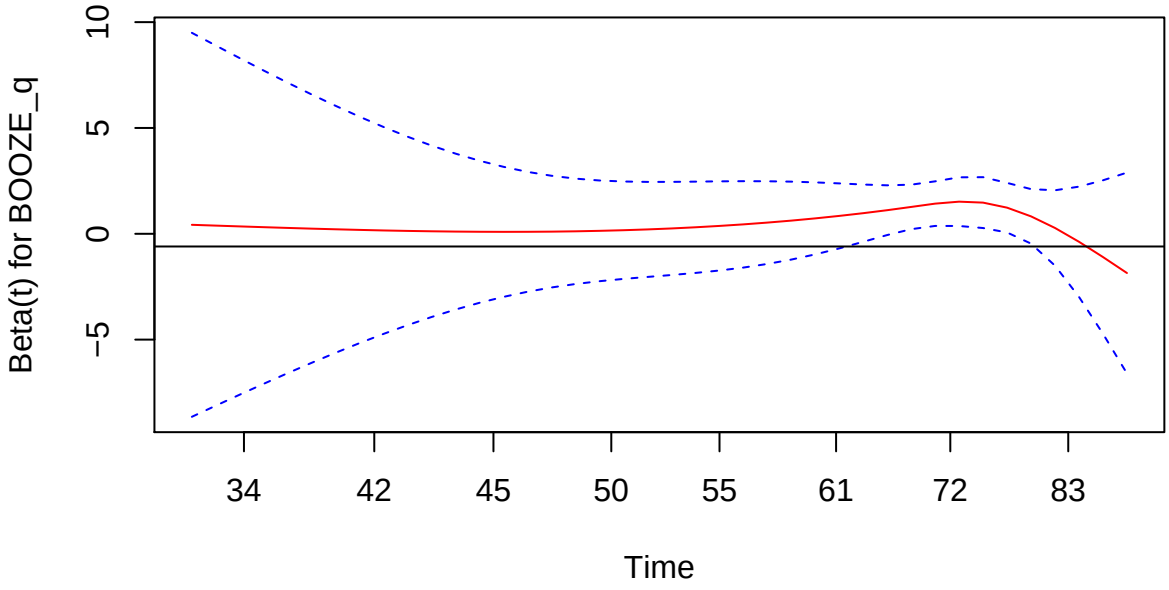
```
## Call:
## coxph(formula = Surv(AGEYRS, AGEDIE, cancer_death) ~ BOOZE_q +
##     SEX + RACE + GRADES + MARRY + SIZE + AVGSMK + SMSA + URBAN,
##     data = data)
##
##   n= 2110, number of events= 556
##
##                     coef exp(coef)  se(coef)      z Pr(>|z|)
## BOOZE_q(0,0.5]  0.030256  1.030718  0.152827  0.198   0.8431
## BOOZE_q(0.5,2]  0.151853  1.163989  0.128545  1.181   0.2375
## BOOZE_q(2,77]   0.231967  1.261078  0.108296  2.142   0.0322 *
## SEX            -0.094951  0.909418  0.092146 -1.030   0.3028
## RACE            0.099011  1.104079  0.122894  0.806   0.4204
## GRADES          0.012468  1.012546  0.012770  0.976   0.3289
## MARRY          -0.046451  0.954611  0.041285 -1.125   0.2605
## SIZE           -0.024198  0.976092  0.035141 -0.689   0.4911
## AVGSMK          0.011814  1.011884  0.002952  4.001  6.3e-05 ***
## SMSA           -0.001426  0.998575  0.054413 -0.026   0.9791
## URBAN           0.091674  1.096008  0.158731  0.578   0.5636
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##                exp(coef) exp(-coef) lower .95 upper .95
## BOOZE_q(0,0.5]    1.0307     0.9702    0.7639     1.391
## BOOZE_q(0.5,2]    1.1640     0.8591    0.9048     1.497
## BOOZE_q(2,77]     1.2611     0.7930    1.0199     1.559
## SEX               0.9094     1.0996    0.7592     1.089
## RACE              1.1041     0.9057    0.8677     1.405
## GRADES            1.0125     0.9876    0.9875     1.038
## MARRY             0.9546     1.0475    0.8804     1.035
## SIZE              0.9761     1.0245    0.9111     1.046
## AVGSMK            1.0119     0.9883    1.0060     1.018
## SMSA              0.9986     1.0014    0.8976     1.111
## URBAN             1.0960     0.9124    0.8030     1.496
##
## Concordance= 0.589  (se = 0.013 )
## Likelihood ratio test= 32.22  on 11 df,   p=7e-04
## Wald test            = 34.18  on 11 df,   p=3e-04
## Score (logrank) test = 34.43  on 11 df,   p=3e-04

##           chisq df       p
## BOOZE_q  4.9235  3 0.17748
## SEX     14.3421  1 0.00015
## RACE     4.5890  1 0.03218
## GRADES   2.0953  1 0.14775
## MARRY    1.3804  1 0.24003
## SIZE     0.2398  1 0.62433
## AVGSMK  10.9195  1 0.00095
## SMSA     0.0631  1 0.80166
## URBAN    0.0519  1 0.81985
## GLOBAL  35.0953 11 0.00024
```


Beta(t) for BOOZE_q
5
0
−5
−10
−15
34
42
45
50
55
61
72
83
Time

~ BOOZE_q + SEX + BOOZE_q * SEX + RACE + GRADES + MARRY + SIZE + AVGSMK + SMSA + URBAN

```
## Call:
## coxph(formula = Surv(AGEYRS, AGEDIE, cancer_death) ~ BOOZE_q +
##     SEX + BOOZE_q * SEX + RACE + GRADES + MARRY + SIZE + AVGSMK +
##     SMSA + URBAN, data = data)
##
##   n= 2110, number of events= 556
##
##                          coef  exp(coef)   se(coef)      z Pr(>|z|)
## BOOZE_q(0,0.5]     -0.5998552  0.5488911  0.4990008 -1.202   0.2293
## BOOZE_q(0.5,2]     -0.6136167  0.5413893  0.3861327 -1.589   0.1120
## BOOZE_q(2,77]      -0.3134365  0.7309308  0.3065896 -1.022   0.3066
## SEX                -0.3279080  0.7204293  0.1318230 -2.487   0.0129 *
## RACE                0.1062188  1.1120652  0.1227879  0.865   0.3870
## GRADES              0.0120579  1.0121309  0.0127511  0.946   0.3443
## MARRY              -0.0492749  0.9519195  0.0413603 -1.191   0.2335
## SIZE               -0.0234216  0.9768506  0.0349752 -0.670   0.5031
## AVGSMK              0.0118307  1.0119010  0.0029659  3.989 6.64e-05 ***
## SMSA                0.0002726  1.0002726  0.0543100  0.005   0.9960
## URBAN               0.0820093  1.0854659  0.1585352  0.517   0.6050
## BOOZE_q(0,0.5]:SEX  0.4155479  1.5152006  0.3068690  1.354   0.1757
## BOOZE_q(0.5,2]:SEX  0.5299198  1.6987961  0.2515599  2.107   0.0352 *
## BOOZE_q(2,77]:SEX   0.3921858  1.4802128  0.2155599  1.819   0.0689 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##                    exp(coef) exp(-coef) lower .95 upper .95
## BOOZE_q(0,0.5]        0.5489     1.8219    0.2064    1.4596
## BOOZE_q(0.5,2]        0.5414     1.8471    0.2540    1.1539
## BOOZE_q(2,77]         0.7309     1.3681    0.4008    1.3330
## SEX                   0.7204     1.3881    0.5564    0.9328
## RACE                  1.1121     0.8992    0.8742    1.4146
## GRADES                1.0121     0.9880    0.9871    1.0377
## MARRY                 0.9519     1.0505    0.8778    1.0323
## SIZE                  0.9769     1.0237    0.9121    1.0462
## AVGSMK                1.0119     0.9882    1.0060    1.0178
## SMSA                  1.0003     0.9997    0.8993    1.1126
## URBAN                 1.0855     0.9213    0.7956    1.4810
## BOOZE_q(0,0.5]:SEX    1.5152     0.6600    0.8304    2.7649
## BOOZE_q(0.5,2]:SEX    1.6988     0.5887    1.0376    2.7814
## BOOZE_q(2,77]:SEX     1.4802     0.6756    0.9702    2.2584
##
## Concordance= 0.59  (se = 0.013 )
## Likelihood ratio test= 38.57  on 14 df,   p=4e-04
## Wald test            = 39.38  on 14 df,   p=3e-04
## Score (logrank) test = 39.85  on 14 df,   p=3e-04

##               chisq df      p
## BOOZE_q      4.9328  3 0.1768
## SEX         12.1289  1 0.0005
## RACE         4.7812  1 0.0288
## GRADES       2.0451  1 0.1527
```

```
## MARRY        1.1405  1 0.2855
## SIZE         0.1254  1 0.7232
## AVGSMK      10.7729  1 0.0010
## SMSA         0.0224  1 0.8811
## URBAN        0.0825  1 0.7739
## BOOZE_q:SEX  6.3282  3 0.0967
## GLOBAL      34.0037 14 0.0021
```



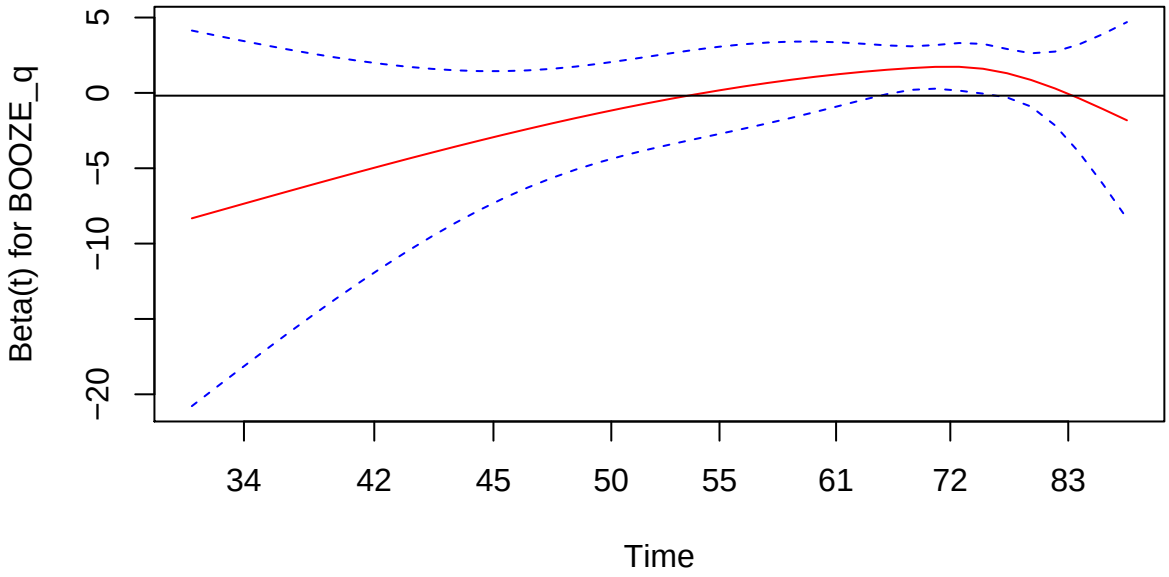

```
##                          [,1]      [,2]     [,3]
## BOOZE_q(2,77]        0.7309308 0.4007806 1.333048
## BOOZE_q(2,77]:SEX    1.4802128 1.0447175 2.097246
```

~ BOOZE_q +BOOZE_q*stratify(SEX) + RACE + GRADES + MARRY + SIZE + AVGSMK + SMSA + URBAN, stratify by SEX

```
## Call:
## coxph(formula = Surv(AGEYRS, AGEDIE, cancer_death) ~ BOOZE_q +
##     strata(SEX) + BOOZE_q * strata(SEX) + RACE + GRADES + MARRY +
##     SIZE + AVGSMK + SMSA + URBAN, data = data)
##
##   n= 2110, number of events= 556
##
##                                       coef exp(coef)  se(coef)      z Pr(>|z|)
## BOOZE_q(0,0.5]                   -0.184162  0.831801  0.227557 -0.809   0.4183
## BOOZE_q(0.5,2]                   -0.055978  0.945560  0.170652 -0.328   0.7429
## BOOZE_q(2,77]                     0.098982  1.104046  0.129012  0.767   0.4429
## RACE                              0.120593  1.128165  0.122723  0.983   0.3258
## GRADES                            0.013587  1.013680  0.012767  1.064   0.2872
## MARRY                            -0.035928  0.964709  0.041331 -0.869   0.3847
## SIZE                             -0.023308  0.976961  0.034680 -0.672   0.5015
## AVGSMK                            0.011948  1.012020  0.002937  4.068 4.75e-05
## SMSA                              0.006977  1.007001  0.054277  0.129   0.8977
## URBAN                             0.070268  1.072796  0.157594  0.446   0.6557
## BOOZE_q(0,0.5]:strata(SEX)SEX=2   0.421931  1.524903  0.307115  1.374   0.1695
## BOOZE_q(0.5,2]:strata(SEX)SEX=2   0.435697  1.546040  0.254522  1.712   0.0869
## BOOZE_q(2,77]:strata(SEX)SEX=2    0.312709  1.367124  0.217869  1.435   0.1512
##
## BOOZE_q(0,0.5]
## BOOZE_q(0.5,2]
## BOOZE_q(2,77]
## RACE
## GRADES
## MARRY
## SIZE
## AVGSMK                           ***
## SMSA
## URBAN
## BOOZE_q(0,0.5]:strata(SEX)SEX=2
## BOOZE_q(0.5,2]:strata(SEX)SEX=2 .
## BOOZE_q(2,77]:strata(SEX)SEX=2
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##                                  exp(coef) exp(-coef) lower .95 upper .95
## BOOZE_q(0,0.5]                      0.8318     1.2022    0.5325     1.299
## BOOZE_q(0.5,2]                      0.9456     1.0576    0.6768     1.321
## BOOZE_q(2,77]                       1.1040     0.9058    0.8574     1.422
## RACE                                1.1282     0.8864    0.8870     1.435
## GRADES                              1.0137     0.9865    0.9886     1.039
## MARRY                               0.9647     1.0366    0.8896     1.046
## SIZE                                0.9770     1.0236    0.9128     1.046
## AVGSMK                              1.0120     0.9881    1.0062     1.018
## SMSA                                1.0070     0.9930    0.9054     1.120
## URBAN                               1.0728     0.9321    0.7877     1.461
## BOOZE_q(0,0.5]:strata(SEX)SEX=2     1.5249     0.6558    0.8353     2.784
## BOOZE_q(0.5,2]:strata(SEX)SEX=2     1.5460     0.6468    0.9388     2.546
```

```
## BOOZE_q(2,77]:strata(SEX)SEX=2     1.3671     0.7315    0.8920     2.095
##
## Concordance= 0.586  (se = 0.013 )
## Likelihood ratio test= 31.96  on 13 df,   p=0.002
## Wald test            = 33.72  on 13 df,   p=0.001
## Score (logrank) test = 34.05  on 13 df,   p=0.001
```

```
##                         chisq df     p
## BOOZE_q              2.52087  3 0.472
## RACE                 4.14395  1 0.042
## GRADES               2.14590  1 0.143
## MARRY                1.04678  1 0.306
## SIZE                 0.00423  1 0.948
## AVGSMK               9.57930  1 0.002
## SMSA                 0.01247  1 0.911
## URBAN                0.15520  1 0.694
## BOOZE_q:strata(SEX)  2.97075  3 0.396
## GLOBAL              21.71378 13 0.060
```

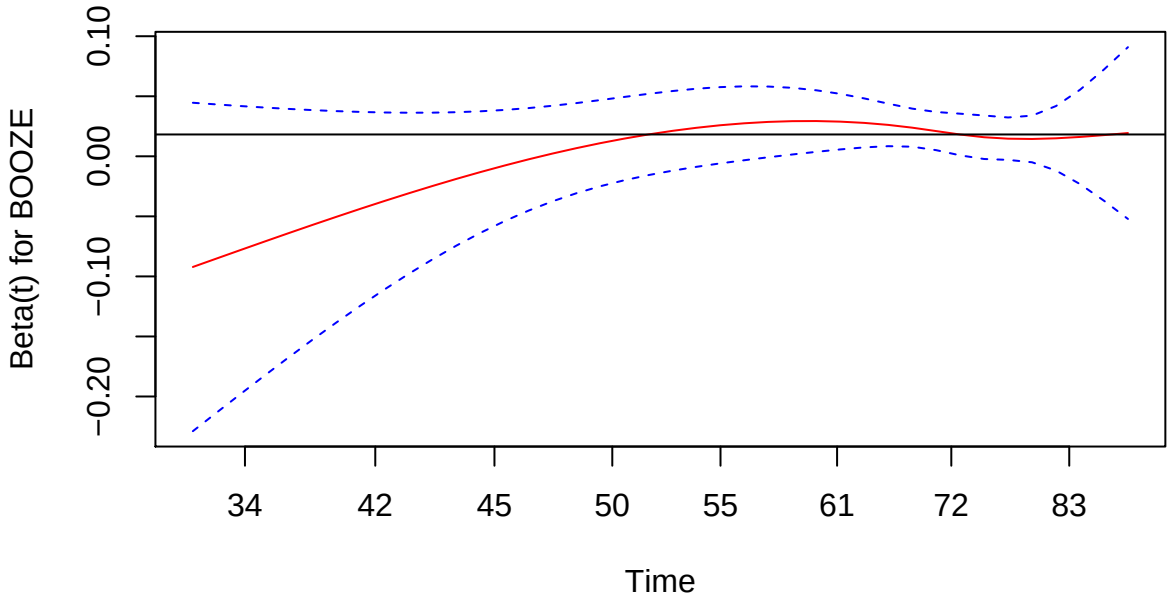



```
##                                    [,1]      [,2]     [,3]
## BOOZE_q(2,77]                  1.104046 0.8573766 1.421683
## BOOZE_q(2,77]:strata(SEX)SEX=2 1.367124 1.2108456 1.543573
```

continuous BOOZE

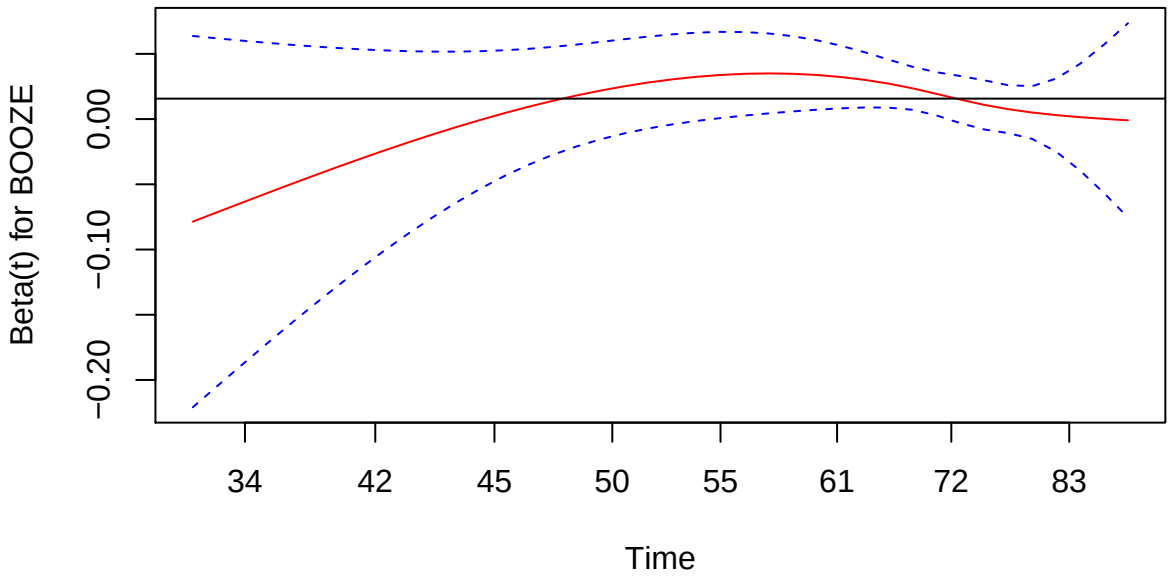
~ BOOZE

```
## Call:
## coxph(formula = Surv(AGEYRS, AGEDIE, cancer_death) ~ BOOZE, data = data)
##
##   n= 2110, number of events= 556
##
##           coef exp(coef) se(coef)     z Pr(>|z|)
## BOOZE 0.018198  1.018365 0.006369 2.857  0.00427 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##       exp(coef) exp(-coef) lower .95 upper .95
## BOOZE     1.018      0.982     1.006     1.031
##
## Concordance= 0.545  (se = 0.013 )
## Likelihood ratio test= 7.11  on 1 df,   p=0.008
## Wald test            = 8.16  on 1 df,   p=0.004
## Score (logrank) test = 8.19  on 1 df,   p=0.004

##        chisq df    p
## BOOZE  0.379  1 0.54
## GLOBAL 0.379  1 0.54
```



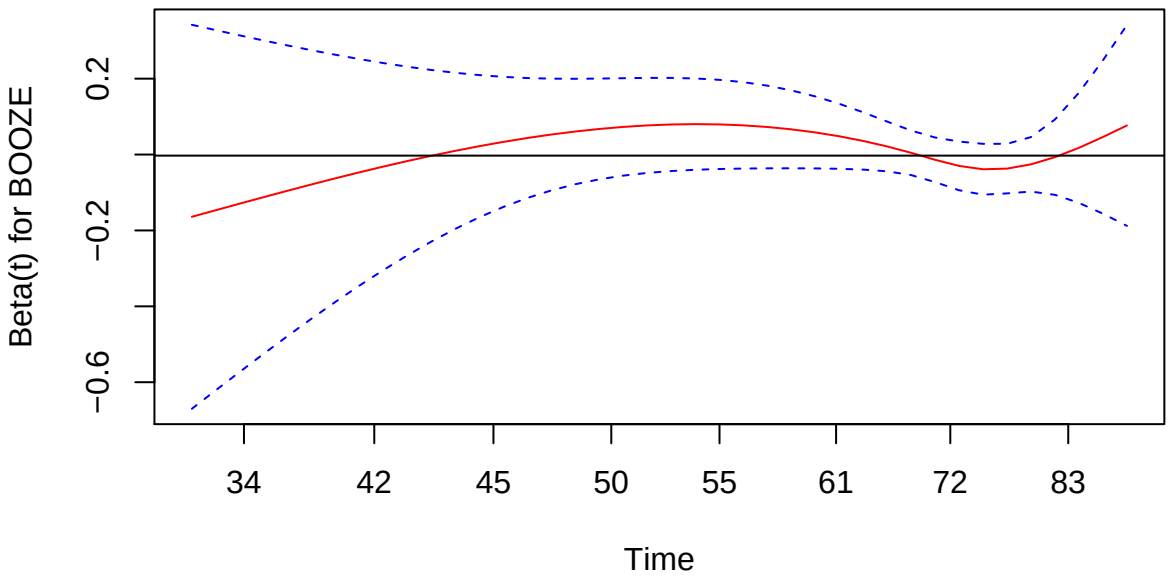
~ BOOZE + SEX

```
## Call:
## coxph(formula = Surv(AGEYRS, AGEDIE, cancer_death) ~ BOOZE +
##     SEX, data = data)
##
##   n= 2110, number of events= 556
##
##            coef exp(coef)  se(coef)      z Pr(>|z|)
## BOOZE  0.015681  1.015805  0.006629  2.366    0.018 *
## SEX   -0.140015  0.869346  0.089385 -1.566    0.117
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##       exp(coef) exp(-coef) lower .95 upper .95
## BOOZE    1.0158     0.9844    1.0027     1.029
## SEX      0.8693     1.1503    0.7296     1.036
##
## Concordance= 0.548  (se = 0.013 )
## Likelihood ratio test= 9.58  on 2 df,   p=0.008
## Wald test            = 10.4  on 2 df,   p=0.006
## Score (logrank) test = 10.46  on 2 df,   p=0.005

##         chisq df       p
## BOOZE   0.338  1 0.56078
## SEX    14.763  1 0.00012
## GLOBAL 15.021  2 0.00055
```



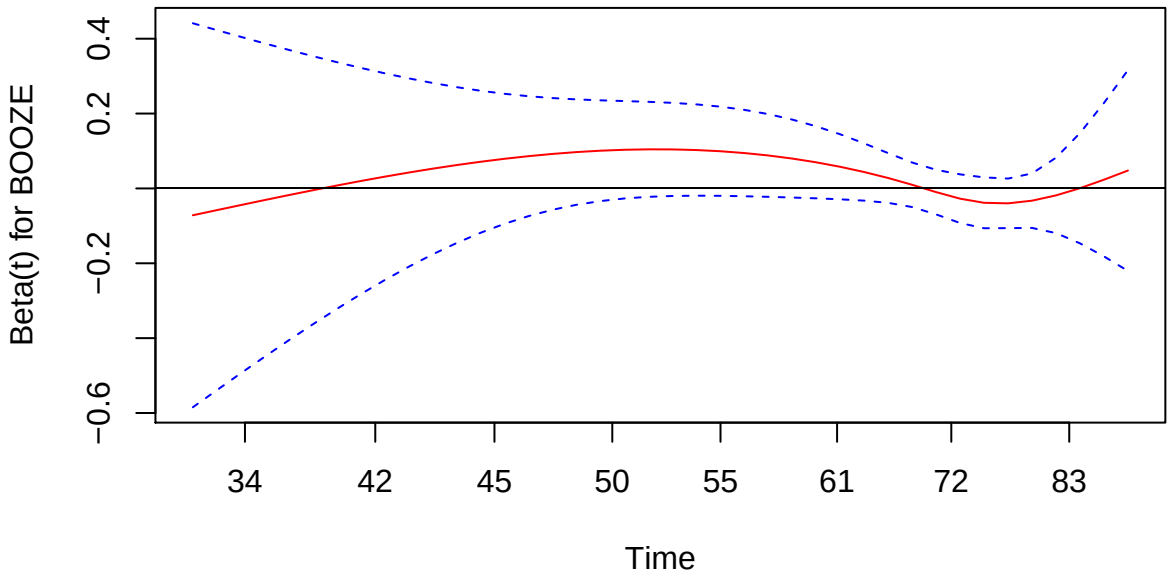
~ BOOZE + SEX + BOOZE * SEX

```
## Call:
## coxph(formula = Surv(AGEYRS, AGEDIE, cancer_death) ~ BOOZE +
##     SEX + BOOZE * SEX, data = data)
##
##   n= 2110, number of events= 556
##
##                coef exp(coef)  se(coef)      z Pr(>|z|)
## BOOZE     -0.002801  0.997203  0.023570 -0.119   0.9054
## SEX       -0.170493  0.843249  0.097157 -1.755   0.0793 .
## BOOZE:SEX  0.016581  1.016719  0.020068  0.826   0.4087
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##           exp(coef) exp(-coef) lower .95 upper .95
## BOOZE        0.9972     1.0028    0.9522     1.044
## SEX          0.8432     1.1859    0.6970     1.020
## BOOZE:SEX    1.0167     0.9836    0.9775     1.058
##
## Concordance= 0.551  (se = 0.013 )
## Likelihood ratio test= 10.23  on 3 df,   p=0.02
## Wald test            = 10.83  on 3 df,   p=0.01
## Score (logrank) test = 10.91  on 3 df,   p=0.01

##             chisq df       p
## BOOZE      0.2834  1 0.59447
## SEX       14.4764  1 0.00014
## BOOZE:SEX  0.0646  1 0.79939
## GLOBAL    15.7031  3 0.00130
```


Beta(t) for BOOZE
0.2
−0.2
−0.6
34
42
45
50
55
61
72
83
Time

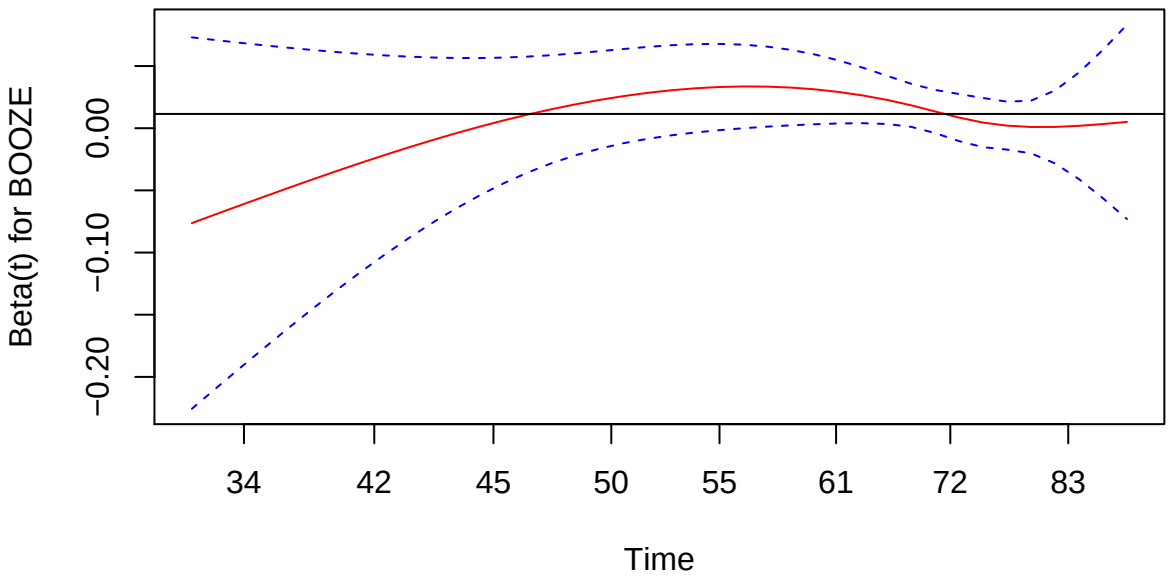
~ BOOZE +BOOZE*SEX, stratify by SEX

```
## Call:
## coxph(formula = Surv(AGEYRS, AGEDIE, cancer_death) ~ BOOZE +
##     strata(SEX) + BOOZE * SEX, data = data)
##
##   n= 2110, number of events= 556
##
##                coef exp(coef) se(coef)     z Pr(>|z|)
## BOOZE     0.001116  1.001117 0.023895 0.047    0.963
## SEX             NA        NA 0.000000    NA       NA
## BOOZE:SEX 0.012993  1.013078 0.020408 0.637    0.524
##
##           exp(coef) exp(-coef) lower .95 upper .95
## BOOZE         1.001     0.9989    0.9553     1.049
## SEX              NA         NA        NA        NA
## BOOZE:SEX     1.013     0.9871    0.9734     1.054
##
## Concordance= 0.538  (se = 0.013 )
## Likelihood ratio test= 5.31  on 2 df,   p=0.07
## Wald test            = 5.88  on 2 df,   p=0.05
## Score (logrank) test = 5.9  on 2 df,   p=0.05

##            chisq df    p
## BOOZE     0.2969  1 0.59
## BOOZE:SEX 0.0268  1 0.87
## GLOBAL    1.7187  2 0.42
```



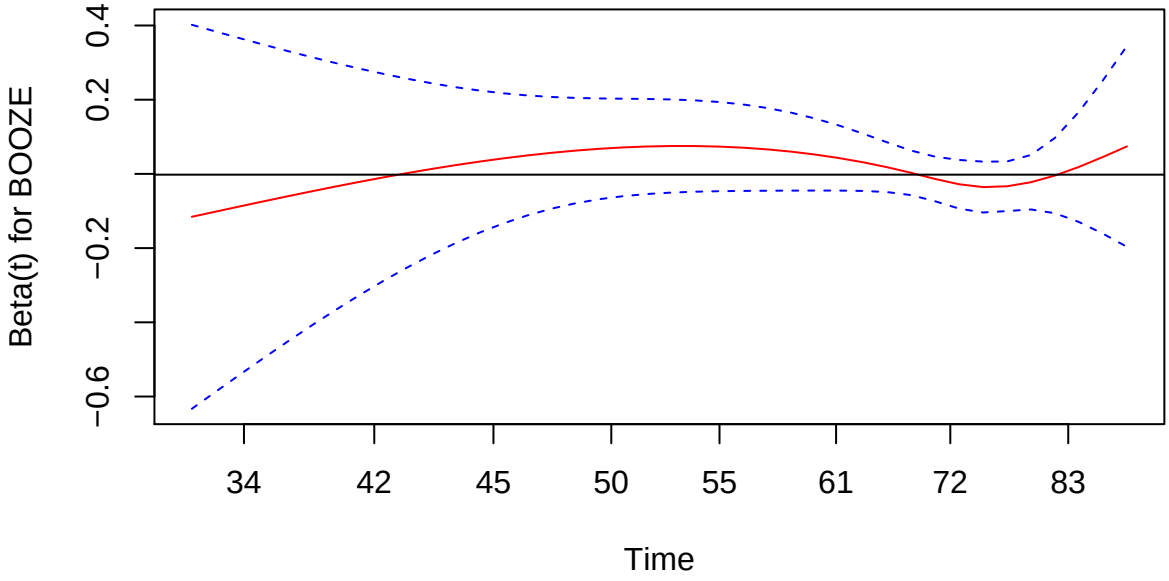
~ BOOZE + SEX + RACE + GRADES + MARRY + SIZE + AVGSMK + SMSA + URBAN

```
## Call:
## coxph(formula = Surv(AGEYRS, AGEDIE, cancer_death) ~ BOOZE +
##     SEX + RACE + GRADES + MARRY + SIZE + AVGSMK + SMSA + URBAN,
##     data = data)
##
##   n= 2110, number of events= 556
##
##             coef exp(coef)  se(coef)      z Pr(>|z|)
## BOOZE   0.011470  1.011536  0.006957  1.649   0.0992 .
## SEX    -0.117041  0.889549  0.091148 -1.284   0.1991
## RACE    0.092575  1.096995  0.122641  0.755   0.4503
## GRADES  0.014466  1.014571  0.012647  1.144   0.2527
## MARRY  -0.046064  0.954981  0.041258 -1.116   0.2642
## SIZE   -0.027210  0.973157  0.035159 -0.774   0.4390
## AVGSMK  0.012133  1.012207  0.002925  4.148 3.35e-05 ***
## SMSA   -0.001875  0.998127  0.054589 -0.034   0.9726
## URBAN   0.084566  1.088245  0.158669  0.533   0.5941
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##        exp(coef) exp(-coef) lower .95 upper .95
## BOOZE     1.0115     0.9886    0.9978     1.025
## SEX       0.8895     1.1242    0.7440     1.064
## RACE      1.0970     0.9116    0.8626     1.395
## GRADES    1.0146     0.9856    0.9897     1.040
## MARRY     0.9550     1.0471    0.8808     1.035
## SIZE      0.9732     1.0276    0.9084     1.043
## AVGSMK    1.0122     0.9879    1.0064     1.018
## SMSA      0.9981     1.0019    0.8968     1.111
## URBAN     1.0882     0.9189    0.7974     1.485
##
## Concordance= 0.583  (se = 0.013 )
## Likelihood ratio test= 29.8  on 9 df,   p=5e-04
## Wald test            = 32.41  on 9 df,   p=2e-04
## Score (logrank) test = 32.57  on 9 df,   p=2e-04

##          chisq df       p
## BOOZE   0.4297  1 0.51212
## SEX    14.9220  1 0.00011
## RACE    4.3012  1 0.03809
## GRADES  1.9367  1 0.16403
## MARRY   1.3503  1 0.24522
## SIZE    0.2748  1 0.60015
## AVGSMK 10.8876  1 0.00097
## SMSA    0.0786  1 0.77917
## URBAN   0.0328  1 0.85633
## GLOBAL 33.6461  9 0.00010
```


Beta(t) for BOOZE
0.00
−0.10
−0.20
34
42
45
50
55
61
72
83
Time

~ BOOZE + SEX + BOOZE_q * SEX + RACE + GRADES + MARRY + SIZE + AVGSMK + SMSA + URBAN

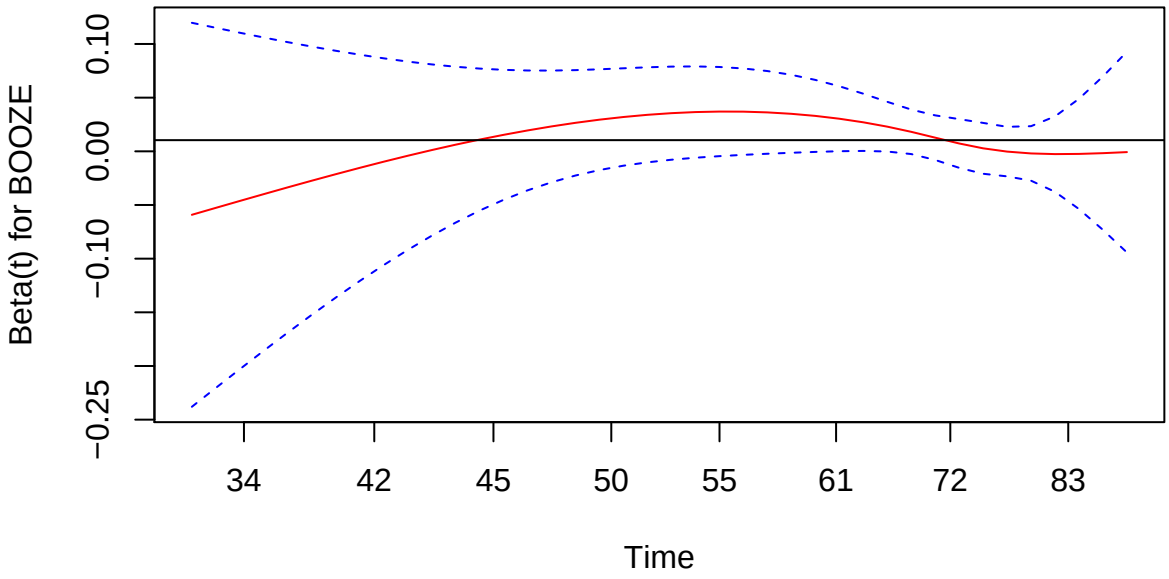
```
## Call:
## coxph(formula = Surv(AGEYRS, AGEDIE, cancer_death) ~ BOOZE +
##     SEX + BOOZE * SEX + RACE + GRADES + MARRY + SIZE + AVGSMK +
##     SMSA + URBAN, data = data)
##
##   n= 2110, number of events= 556
##
##                coef exp(coef)  se(coef)      z Pr(>|z|)
## BOOZE     -0.002032  0.997970  0.024104 -0.084    0.933
## SEX       -0.139580  0.869724  0.099179 -1.407    0.159
## RACE       0.093730  1.098264  0.122633  0.764    0.445
## GRADES     0.013978  1.014077  0.012681  1.102    0.270
## MARRY     -0.046100  0.954946  0.041236 -1.118    0.264
## SIZE      -0.027930  0.972457  0.035160 -0.794    0.427
## AVGSMK     0.012063  1.012136  0.002931  4.115 3.86e-05 ***
## SMSA      -0.001166  0.998835  0.054581 -0.021    0.983
## URBAN      0.086768  1.090644  0.158633  0.547    0.584
## BOOZE:SEX  0.012104  1.012178  0.020522  0.590    0.555
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##           exp(coef) exp(-coef) lower .95 upper .95
## BOOZE        0.9980     1.0020    0.9519     1.046
## SEX          0.8697     1.1498    0.7161     1.056
## RACE         1.0983     0.9105    0.8636     1.397
## GRADES       1.0141     0.9861    0.9892     1.040
## MARRY        0.9549     1.0472    0.8808     1.035
## SIZE         0.9725     1.0283    0.9077     1.042
## AVGSMK       1.0121     0.9880    1.0063     1.018
## SMSA         0.9988     1.0012    0.8975     1.112
## URBAN        1.0906     0.9169    0.7992     1.488
## BOOZE:SEX    1.0122     0.9880    0.9723     1.054
##
## Concordance= 0.584  (se = 0.013 )
## Likelihood ratio test= 30.14  on 10 df,   p=8e-04
## Wald test            = 32.57  on 10 df,   p=3e-04
## Score (logrank) test = 32.76  on 10 df,   p=3e-04


##              chisq df       p
## BOOZE       0.3763  1 0.53961
## SEX        14.7042  1 0.00013
## RACE        4.2847  1 0.03846
## GRADES      1.9756  1 0.15986
## MARRY       1.3421  1 0.24666
## SIZE        0.2846  1 0.59368
## AVGSMK     10.8181  1 0.00101
## SMSA        0.0835  1 0.77258
## URBAN       0.0252  1 0.87384
## BOOZE:SEX   0.1070  1 0.74358
## GLOBAL     34.1511 10 0.00017
```




```
##                [,1]      [,2]     [,3]
## BOOZE     0.9979705 0.9519195 1.046249
## BOOZE:SEX 1.0121777 1.0115915 1.012764
```

~ BOOZE +BOOZE*strata(SEX)+ RACE + GRADES + MARRY + SIZE + AVGSMK + SMSA + URBAN, stratify by SEX

```
## Call:
## coxph(formula = Surv(AGEYRS, AGEDIE, cancer_death) ~ BOOZE +
##     BOOZE * strata(SEX) + strata(SEX) + RACE + GRADES + MARRY +
##     SIZE + AVGSMK + SMSA + URBAN, data = data)
##
##   n= 2110, number of events= 556
##
##                              coef exp(coef)  se(coef)      z Pr(>|z|)
## BOOZE                    0.010391  1.010445  0.007463  1.392    0.164
## RACE                     0.110862  1.117241  0.122548  0.905    0.366
## GRADES                   0.015600  1.015723  0.012687  1.230    0.219
## MARRY                   -0.032328  0.968189  0.041221 -0.784    0.433
## SIZE                    -0.028170  0.972223  0.034804 -0.809    0.418
## AVGSMK                   0.012235  1.012310  0.002899  4.221 2.43e-05 ***
## SMSA                     0.007131  1.007157  0.054524  0.131    0.896
## URBAN                    0.072533  1.075229  0.157705  0.460    0.646
## BOOZE:strata(SEX)SEX=2   0.008045  1.008077  0.020944  0.384    0.701
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##                          exp(coef) exp(-coef) lower .95 upper .95
## BOOZE                       1.0104     0.9897    0.9958     1.025
## RACE                        1.1172     0.8951    0.8787     1.421
## GRADES                      1.0157     0.9845    0.9908     1.041
## MARRY                       0.9682     1.0329    0.8930     1.050
## SIZE                        0.9722     1.0286    0.9081     1.041
## AVGSMK                      1.0123     0.9878    1.0066     1.018
## SMSA                        1.0072     0.9929    0.9051     1.121
## URBAN                       1.0752     0.9300    0.7893     1.465
## BOOZE:strata(SEX)SEX=2      1.0081     0.9920    0.9675     1.050
##
## Concordance= 0.58  (se = 0.013 )
## Likelihood ratio test= 25.55  on 9 df,   p=0.002
## Wald test            = 27.97  on 9 df,   p=0.001
## Score (logrank) test = 28.08  on 9 df,   p=9e-04

##                        chisq df      p
## BOOZE               2.23e-01  1 0.6370
## RACE                3.57e+00  1 0.0588
## GRADES              2.28e+00  1 0.1314
## MARRY               1.16e+00  1 0.2808
## SIZE                6.23e-02  1 0.8029
## AVGSMK              9.31e+00  1 0.0023
## SMSA                4.98e-04  1 0.9822
## URBAN               4.48e-02  1 0.8323
## BOOZE:strata(SEX) 8.47e-01  1 0.3575
## GLOBAL              1.97e+01  9 0.0200
```



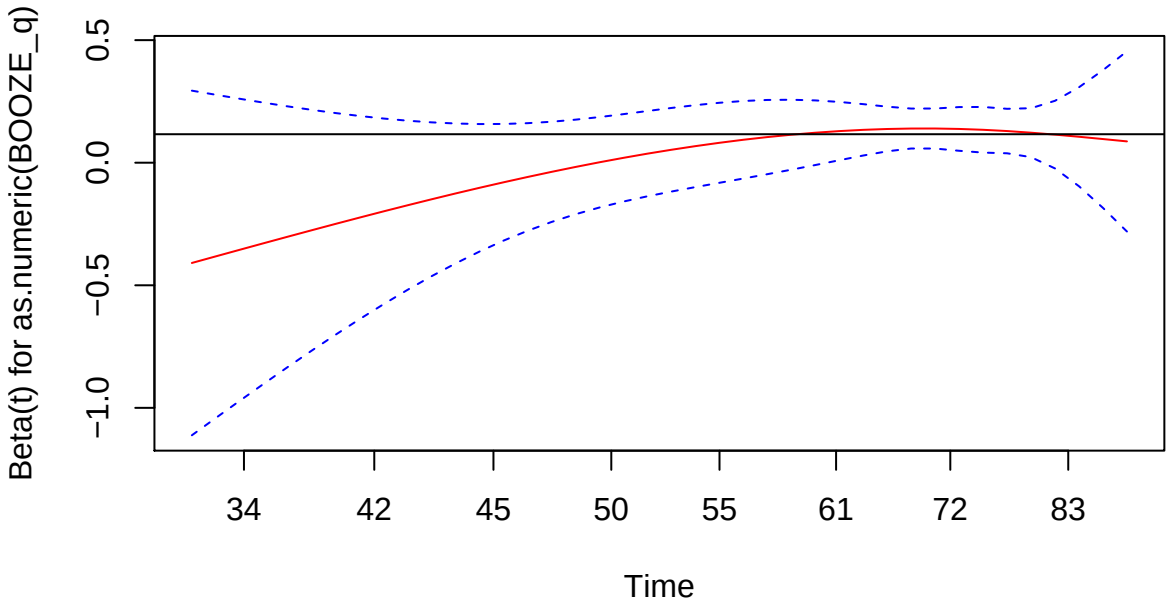

```
##                               [,1]      [,2]     [,3]
## BOOZE                    1.010445 0.9957731 1.025334
## BOOZE:strata(SEX)SEX=2 1.008077 1.0077614 1.008393
```

ordinal BOOZE_q_ordinal

~ BOOZE_q_ordinal

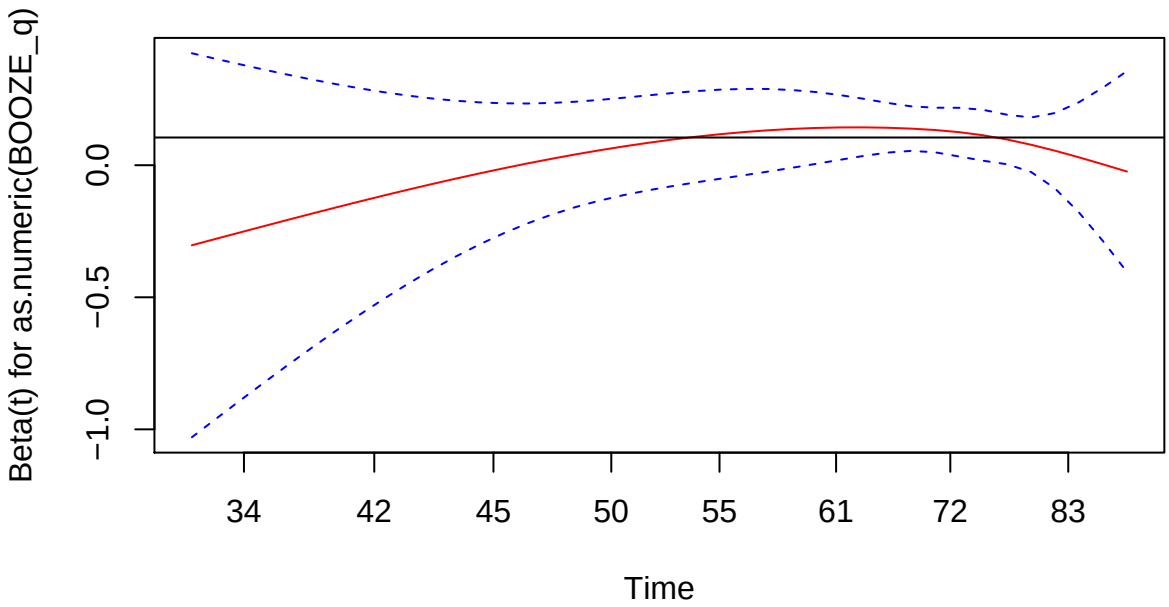
```
## Call:
## coxph(formula = Surv(AGEYRS, AGEDIE, cancer_death) ~ as.numeric(BOOZE_q),
##     data = data)
##
##   n= 2110, number of events= 556
##
##                          coef exp(coef) se(coef)     z Pr(>|z|)
## as.numeric(BOOZE_q) 0.11622   1.12324  0.03274 3.549 0.000386 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##                     exp(coef) exp(-coef) lower .95 upper .95
## as.numeric(BOOZE_q)     1.123     0.8903     1.053     1.198
##
## Concordance= 0.545  (se = 0.012 )
## Likelihood ratio test= 12.47  on 1 df,   p=4e-04
## Wald test            = 12.6  on 1 df,   p=4e-04
## Score (logrank) test = 12.68  on 1 df,   p=4e-04
```

```
##                       chisq df    p
## as.numeric(BOOZE_q)  1.96  1 0.16
## GLOBAL               1.96  1 0.16
```



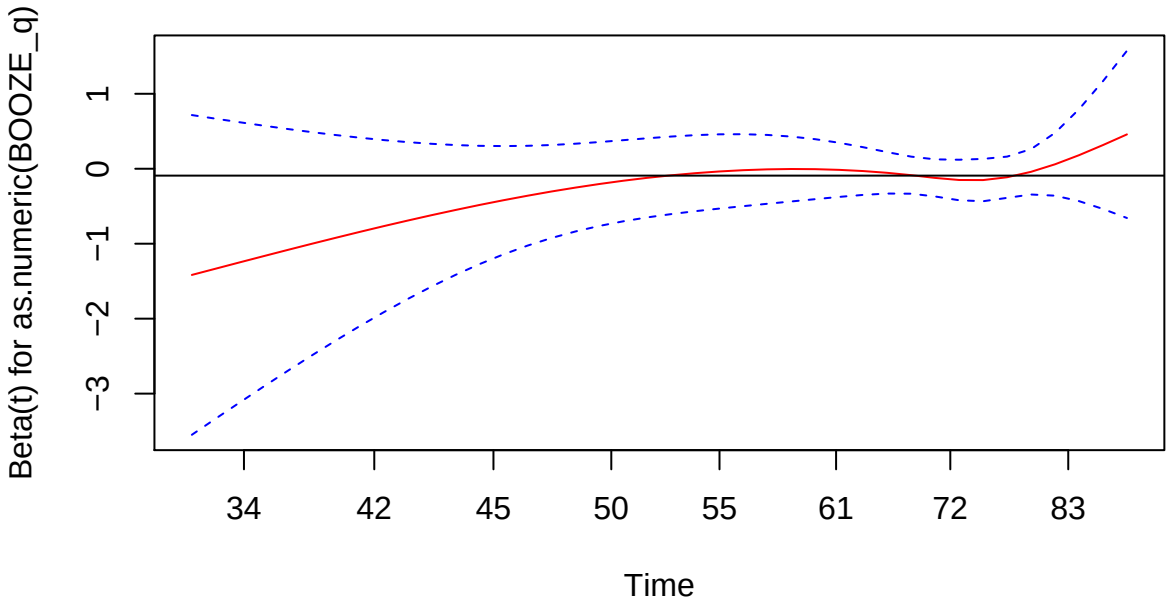
~ BOOZE_q_ordinal + SEX

```
## Call:
## coxph(formula = Surv(AGEYRS, AGEDIE, cancer_death) ~ as.numeric(BOOZE_q) +
##     SEX, data = data)
##
##   n= 2110, number of events= 556
##
##                          coef exp(coef) se(coef)      z Pr(>|z|)
## as.numeric(BOOZE_q)  0.10490   1.11059  0.03386  3.098  0.00195 **
## SEX                 -0.11507   0.89131  0.08986 -1.281  0.20034
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##                     exp(coef) exp(-coef) lower .95 upper .95
## as.numeric(BOOZE_q)    1.1106     0.9004    1.0393     1.187
## SEX                    0.8913     1.1219    0.7474     1.063
##
## Concordance= 0.555  (se = 0.013 )
## Likelihood ratio test= 14.12  on 2 df,   p=9e-04
## Wald test            = 14.23  on 2 df,   p=8e-04
## Score (logrank) test = 14.32  on 2 df,   p=8e-04

##                     chisq df       p
## as.numeric(BOOZE_q)   1.9  1 0.16753
## SEX                  14.3  1 0.00016
## GLOBAL               14.5  2 0.00071
```



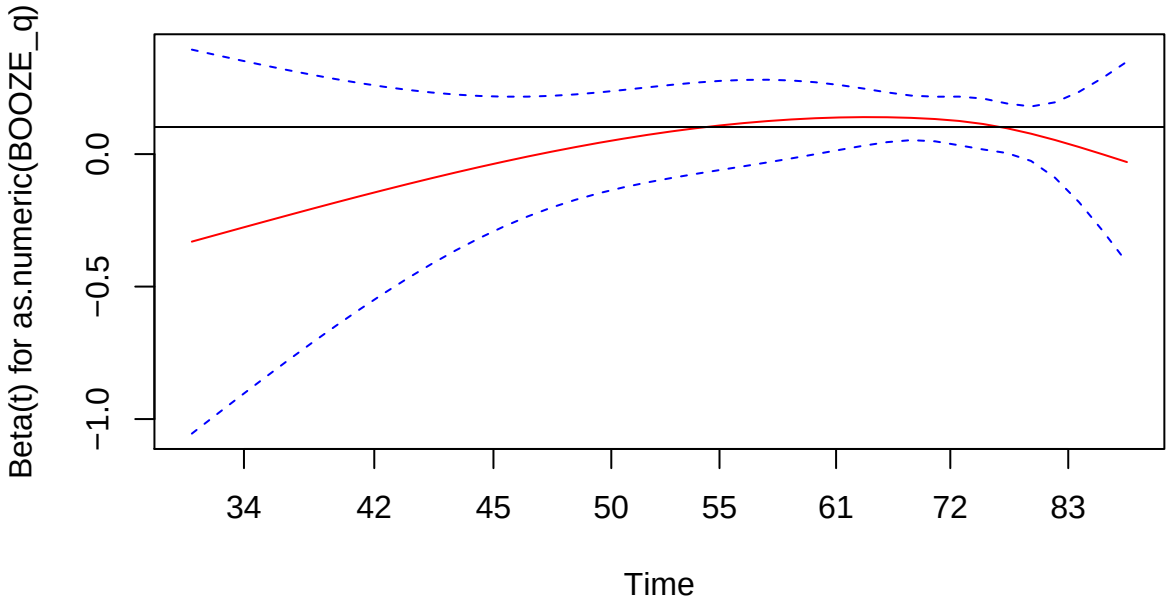
~ BOOZE_q_ordinal + SEX + BOOZE_q_ordinal * SEX

```
## Call:
## coxph(formula = Surv(AGEYRS, AGEDIE, cancer_death) ~ as.numeric(BOOZE_q) +
##     SEX + as.numeric(BOOZE_q) * SEX, data = data)
##
##   n= 2110, number of events= 556
##
##                             coef exp(coef) se(coef)      z Pr(>|z|)
## as.numeric(BOOZE_q)     -0.09187   0.91223  0.09934 -0.925   0.3551
## SEX                     -0.43802   0.64531  0.17821 -2.458   0.0140 *
## as.numeric(BOOZE_q):SEX  0.14426   1.15519  0.06830  2.112   0.0347 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##                         exp(coef) exp(-coef) lower .95 upper .95
## as.numeric(BOOZE_q)        0.9122     1.0962    0.7508    1.1083
## SEX                        0.6453     1.5496    0.4551    0.9151
## as.numeric(BOOZE_q):SEX    1.1552     0.8657    1.0104    1.3207
##
## Concordance= 0.559  (se = 0.013 )
## Likelihood ratio test= 18.51  on 3 df,   p=3e-04
## Wald test            = 17.95  on 3 df,   p=5e-04
## Score (logrank) test = 18.14  on 3 df,   p=4e-04

##                         chisq df       p
## as.numeric(BOOZE_q)      1.62  1 0.20290
## SEX                     12.40  1 0.00043
## as.numeric(BOOZE_q):SEX  1.06  1 0.30254
## GLOBAL                  12.91  3 0.00484
```


Beta(t) for as.numeric(BOOZE_q)
1
0
−1
−2
−3
34
42
45
50
55
61
72
83
Time

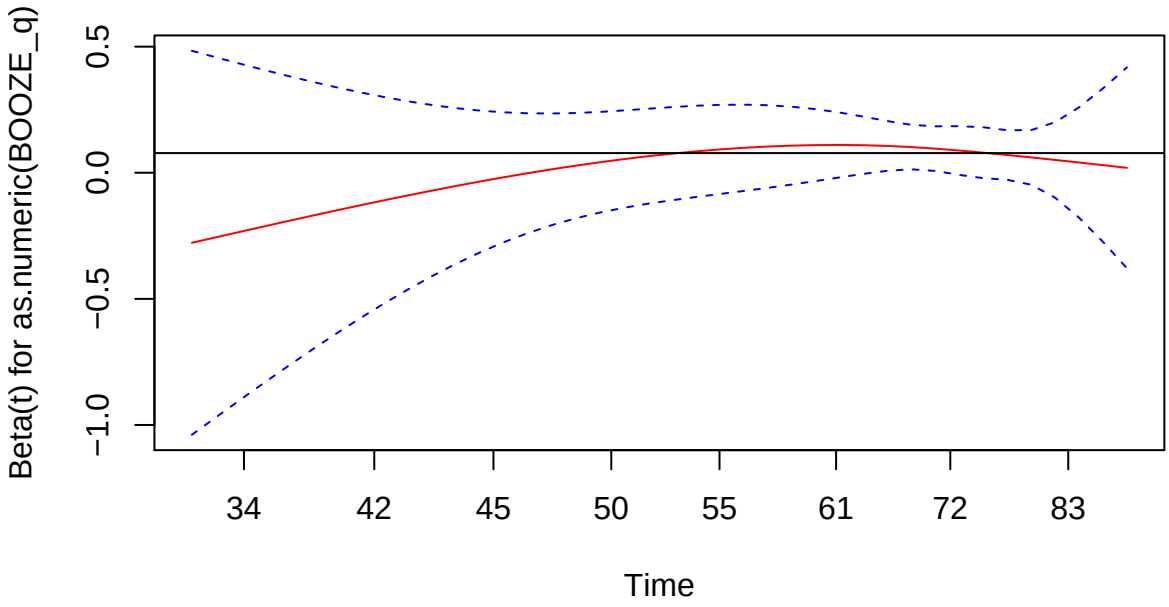
~ BOOZE_q_ordinal, stratify by SEX

```
## Call:
## coxph(formula = Surv(AGEYRS, AGEDIE, cancer_death) ~ as.numeric(BOOZE_q) +
##     strata(SEX), data = data)
##
##   n= 2110, number of events= 556
##
##                          coef exp(coef) se(coef)    z Pr(>|z|)
## as.numeric(BOOZE_q) 0.10227   1.10768  0.03375 3.03  0.00245 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##                     exp(coef) exp(-coef) lower .95 upper .95
## as.numeric(BOOZE_q)     1.108     0.9028     1.037     1.183
##
## Concordance= 0.537  (se = 0.013 )
## Likelihood ratio test= 9.13  on 1 df,   p=0.003
## Wald test            = 9.18  on 1 df,   p=0.002
## Score (logrank) test = 9.22  on 1 df,   p=0.002

##                     chisq df   p
## as.numeric(BOOZE_q) 0.274  1 0.6
## GLOBAL              0.274  1 0.6
```



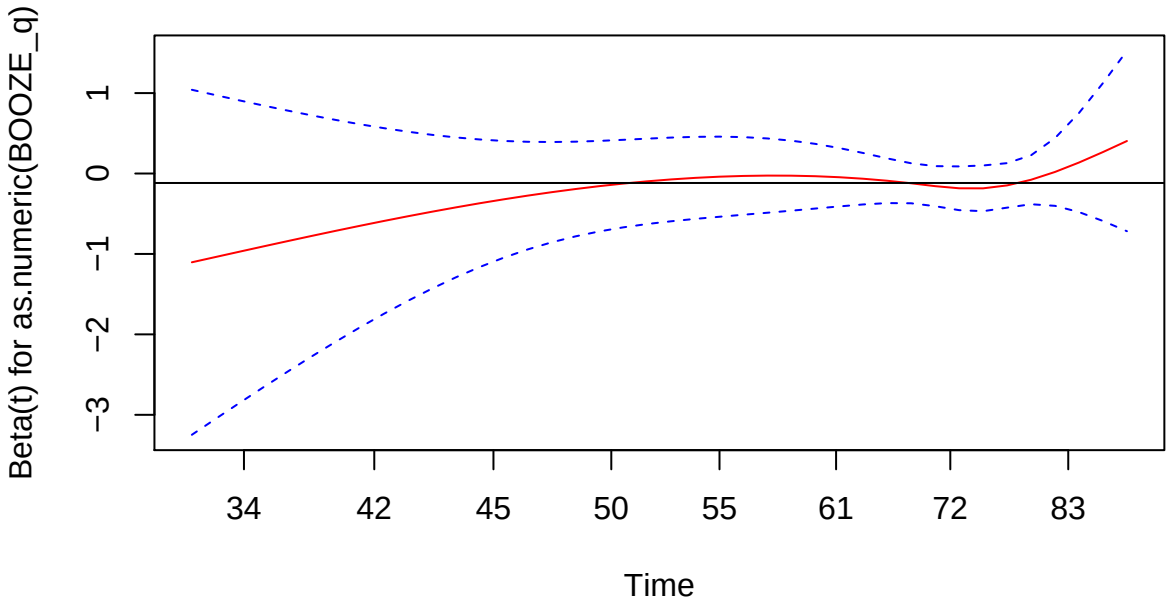
~ BOOZE_q_ordinal + SEX + RACE + GRADES + MARRY + SIZE + AVGSMK + SMSA + URBAN

```
## Call:
## coxph(formula = Surv(AGEYRS, AGEDIE, cancer_death) ~ as.numeric(BOOZE_q) +
##     SEX + RACE + GRADES + MARRY + SIZE + AVGSMK + SMSA + URBAN,
##     data = data)
##
##   n= 2110, number of events= 556
##
##                          coef exp(coef)  se(coef)      z Pr(>|z|)
## as.numeric(BOOZE_q)  0.077996  1.081119  0.035455  2.200   0.0278 *
## SEX                 -0.096443  0.908062  0.091973 -1.049   0.2944
## RACE                 0.098073  1.103043  0.122715  0.799   0.4242
## GRADES               0.012319  1.012395  0.012745  0.967   0.3338
## MARRY               -0.046367  0.954692  0.041275 -1.123   0.2613
## SIZE                -0.023779  0.976502  0.035105 -0.677   0.4982
## AVGSMK               0.011826  1.011896  0.002954  4.004 6.23e-05 ***
## SMSA                -0.001555  0.998447  0.054381 -0.029   0.9772
## URBAN                0.089521  1.093650  0.158589  0.564   0.5724
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##                     exp(coef) exp(-coef) lower .95 upper .95
## as.numeric(BOOZE_q)    1.0811     0.9250    1.0085     1.159
## SEX                    0.9081     1.1012    0.7583     1.087
## RACE                   1.1030     0.9066    0.8672     1.403
## GRADES                 1.0124     0.9878    0.9874     1.038
## MARRY                  0.9547     1.0475    0.8805     1.035
## SIZE                   0.9765     1.0241    0.9116     1.046
## AVGSMK                 1.0119     0.9882    1.0061     1.018
## SMSA                   0.9984     1.0016    0.8975     1.111
## URBAN                  1.0936     0.9144    0.8015     1.492
##
## Concordance= 0.589  (se = 0.013 )
## Likelihood ratio test= 32.11  on 9 df,   p=2e-04
## Wald test            = 34.01  on 9 df,   p=9e-05
## Score (logrank) test = 34.24  on 9 df,   p=8e-05

##                       chisq df       p
## as.numeric(BOOZE_q)  2.2654  1 0.13229
## SEX                 14.3288  1 0.00015
## RACE                 4.5176  1 0.03355
## GRADES               2.1064  1 0.14668
## MARRY                1.3844  1 0.23935
## SIZE                 0.2532  1 0.61482
## AVGSMK              10.9534  1 0.00093
## SMSA                 0.0702  1 0.79102
## URBAN                0.0478  1 0.82691
## GLOBAL              33.1701  9 0.00012
```


Beta(t) for as.numeric(BOOZE_q)
0.5
0.0
−0.5
−1.0
34
42
45
50
55
61
72
83
Time

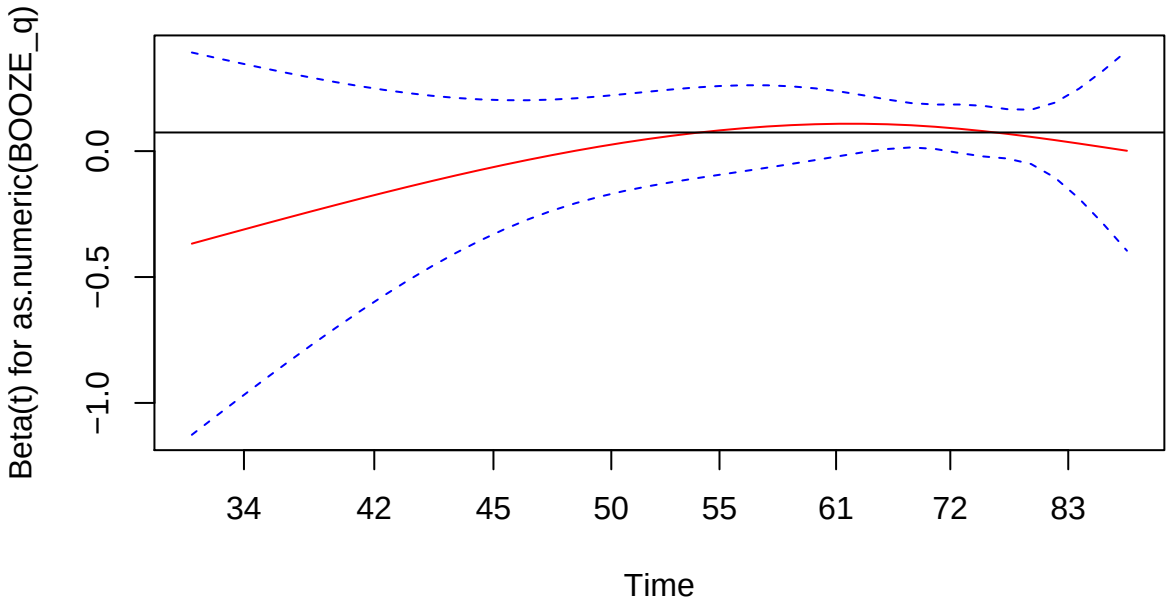
~ BOOZE_q_ordinal + SEX + BOOZE_q_ordinal * SEX + RACE + GRADES + MARRY + SIZE + AVGSMK + SMSA + URBAN

```
## Call:
## coxph(formula = Surv(AGEYRS, AGEDIE, cancer_death) ~ as.numeric(BOOZE_q) +
##     SEX + as.numeric(BOOZE_q) * SEX + RACE + GRADES + MARRY +
##     SIZE + AVGSMK + SMSA + URBAN, data = data)
##
##   n= 2110, number of events= 556
##
##                               coef  exp(coef)   se(coef)      z Pr(>|z|)
## as.numeric(BOOZE_q)     -1.175e-01  8.891e-01  9.990e-02 -1.177   0.2393
## SEX                     -4.173e-01  6.588e-01  1.793e-01 -2.328   0.0199 *
## RACE                     1.044e-01  1.110e+00  1.224e-01  0.854   0.3933
## GRADES                   1.178e-02  1.012e+00  1.275e-02  0.924   0.3554
## MARRY                   -4.697e-02  9.541e-01  4.132e-02 -1.137   0.2556
## SIZE                    -2.346e-02  9.768e-01  3.492e-02 -0.672   0.5017
## AVGSMK                   1.186e-02  1.012e+00  2.959e-03  4.008 6.13e-05 ***
## SMSA                     7.838e-05  1.000e+00  5.428e-02  0.001   0.9988
## URBAN                    8.165e-02  1.085e+00  1.583e-01  0.516   0.6059
## as.numeric(BOOZE_q):SEX  1.436e-01  1.154e+00  6.840e-02  2.099   0.0358 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##                         exp(coef) exp(-coef) lower .95 upper .95
## as.numeric(BOOZE_q)        0.8891     1.1247    0.7310    1.0814
## SEX                        0.6588     1.5179    0.4636    0.9361
## RACE                       1.1101     0.9008    0.8734    1.4109
## GRADES                     1.0118     0.9883    0.9869    1.0374
## MARRY                      0.9541     1.0481    0.8799    1.0346
## SIZE                       0.9768     1.0237    0.9122    1.0460
## AVGSMK                     1.0119     0.9882    1.0061    1.0178
## SMSA                       1.0001     0.9999    0.8991    1.1123
## URBAN                      1.0851     0.9216    0.7957    1.4797
## as.numeric(BOOZE_q):SEX    1.1544     0.8663    1.0096    1.3200
##
## Concordance= 0.591  (se = 0.013 )
## Likelihood ratio test= 36.46  on 10 df,   p=7e-05
## Wald test            = 37.57  on 10 df,   p=5e-05
## Score (logrank) test = 37.91  on 10 df,   p=4e-05


##                           chisq df       p
## as.numeric(BOOZE_q)      1.9746  1 0.15997
## SEX                     12.3135  1 0.00045
## RACE                     4.5550  1 0.03282
## GRADES                   2.0847  1 0.14878
## MARRY                    1.2619  1 0.26129
## SIZE                     0.1993  1 0.65528
## AVGSMK                  11.0903  1 0.00087
## SMSA                     0.0526  1 0.81867
## URBAN                    0.0454  1 0.83120
## as.numeric(BOOZE_q):SEX  0.7052  1 0.40105
## GLOBAL                  31.8035 10 0.00043
```


Beta(t) for as.numeric(BOOZE_q)
1
0
−1
−2
−3
34
42
45
50
55
61
72
83
Time

~ BOOZE_q_ordinal + RACE + GRADES + MARRY + SIZE + AVGSMK + SMSA + URBAN, stratify by SEX

```
## Call:
## coxph(formula = Surv(AGEYRS, AGEDIE, cancer_death) ~ as.numeric(BOOZE_q) +
##     strata(SEX) + RACE + GRADES + MARRY + SIZE + AVGSMK + SMSA +
##     URBAN, data = data)
##
##   n= 2110, number of events= 556
##
##                          coef exp(coef)  se(coef)      z Pr(>|z|)
## as.numeric(BOOZE_q)  0.074018  1.076826  0.035358  2.093   0.0363 *
## RACE                 0.114478  1.121287  0.122556  0.934   0.3503
## GRADES               0.013867  1.013964  0.012760  1.087   0.2771
## MARRY               -0.032261  0.968254  0.041246 -0.782   0.4341
## SIZE                -0.023959  0.976326  0.034758 -0.689   0.4906
## AVGSMK               0.012010  1.012083  0.002921  4.111 3.93e-05 ***
## SMSA                 0.006213  1.006232  0.054317  0.114   0.9089
## URBAN                0.075532  1.078457  0.157605  0.479   0.6318
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##                     exp(coef) exp(-coef) lower .95 upper .95
## as.numeric(BOOZE_q)    1.0768     0.9287    1.0047     1.154
## RACE                   1.1213     0.8918    0.8819     1.426
## GRADES                 1.0140     0.9862    0.9889     1.040
## MARRY                  0.9683     1.0328    0.8931     1.050
## SIZE                   0.9763     1.0242    0.9120     1.045
## AVGSMK                 1.0121     0.9881    1.0063     1.018
## SMSA                   1.0062     0.9938    0.9046     1.119
## URBAN                  1.0785     0.9273    0.7919     1.469
##
## Concordance= 0.582  (se = 0.013 )
## Likelihood ratio test= 27.35  on 8 df,   p=6e-04
## Wald test            = 29.19  on 8 df,   p=3e-04
## Score (logrank) test = 29.38  on 8 df,   p=3e-04

##                         chisq df      p
## as.numeric(BOOZE_q) 4.48e-01  1 0.5032
## RACE                3.81e+00  1 0.0508
## GRADES              2.35e+00  1 0.1256
## MARRY               1.21e+00  1 0.2705
## SIZE                4.52e-02  1 0.8316
## AVGSMK              9.42e+00  1 0.0022
## SMSA                3.53e-05  1 0.9953
## URBAN               7.80e-02  1 0.7800
## GLOBAL              1.89e+01  8 0.0156
```


Beta(t) for as.numeric(BOOZE_q)
0.0
−0.5
−1.0
34
42
45
50
55
61
72
83
Time