Survival analysis

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```r
library(survival)

## Warning: package 'survival' was built under R version 3.5.3

library(survminer)

## Warning: package 'survminer' was built under R version 3.5.3

## Loading required package: ggplot2

## Warning: package 'ggplot2' was built under R version 3.5.3

## Loading required package: ggpubr

## Warning: package 'ggpubr' was built under R version 3.5.3

## Loading required package: magrittr

## Warning: package 'magrittr' was built under R version 3.5.3

attach(lung)
survobj<- with(lung,Surv(time ,status))
```

Kaplan-Meier estimator

```r
fit0<-survfit(survobj~1,data = lung)
summary(fit0)

## Call: survfit(formula = survobj ~ 1, data = lung)
##
##  time n.risk n.event survival std.err lower 95% CI upper 95% CI
##     5    228       1   0.9956 0.00438       0.9871        1.000
##    11    227       3   0.9825 0.00869       0.9656        1.000
##    12    224       1   0.9781 0.00970       0.9592        0.997
##    13    223       2   0.9693 0.01142       0.9472        0.992
##    15    221       1   0.9649 0.01219       0.9413        0.989
##    26    220       1   0.9605 0.01290       0.9356        0.986
##    30    219       1   0.9561 0.01356       0.9299        0.983
##    31    218       1   0.9518 0.01419       0.9243        0.980
##    53    217       2   0.9430 0.01536       0.9134        0.974
##    54    215       1   0.9386 0.01590       0.9079        0.970
##    59    214       1   0.9342 0.01642       0.9026        0.967
##    60    213       2   0.9254 0.01740       0.8920        0.960
##    61    211       1   0.9211 0.01786       0.8867        0.957
```

```
##    62    210       1   0.9167 0.01830        0.8815        0.953
##    65    209       2   0.9079 0.01915        0.8711        0.946
##    71    207       1   0.9035 0.01955        0.8660        0.943
##    79    206       1   0.8991 0.01995        0.8609        0.939
##    81    205       2   0.8904 0.02069        0.8507        0.932
##    88    203       2   0.8816 0.02140        0.8406        0.925
##    92    201       1   0.8772 0.02174        0.8356        0.921
##    93    199       1   0.8728 0.02207        0.8306        0.917
##    95    198       2   0.8640 0.02271        0.8206        0.910
##   105    196       1   0.8596 0.02302        0.8156        0.906
##   107    194       2   0.8507 0.02362        0.8056        0.898
##   110    192       1   0.8463 0.02391        0.8007        0.894
##   116    191       1   0.8418 0.02419        0.7957        0.891
##   118    190       1   0.8374 0.02446        0.7908        0.887
##   122    189       1   0.8330 0.02473        0.7859        0.883
##   131    188       1   0.8285 0.02500        0.7810        0.879
##   132    187       2   0.8197 0.02550        0.7712        0.871
##   135    185       1   0.8153 0.02575        0.7663        0.867
##   142    184       1   0.8108 0.02598        0.7615        0.863
##   144    183       1   0.8064 0.02622        0.7566        0.859
##   145    182       2   0.7975 0.02667        0.7469        0.852
##   147    180       1   0.7931 0.02688        0.7421        0.848
##   153    179       1   0.7887 0.02710        0.7373        0.844
##   156    178       2   0.7798 0.02751        0.7277        0.836
##   163    176       3   0.7665 0.02809        0.7134        0.824
##   166    173       2   0.7577 0.02845        0.7039        0.816
##   167    171       1   0.7532 0.02863        0.6991        0.811
##   170    170       1   0.7488 0.02880        0.6944        0.807
##   175    167       1   0.7443 0.02898        0.6896        0.803
##   176    165       1   0.7398 0.02915        0.6848        0.799
##   177    164       1   0.7353 0.02932        0.6800        0.795
##   179    162       2   0.7262 0.02965        0.6704        0.787
##   180    160       1   0.7217 0.02981        0.6655        0.783
##   181    159       2   0.7126 0.03012        0.6559        0.774
##   182    157       1   0.7081 0.03027        0.6511        0.770
##   183    156       1   0.7035 0.03041        0.6464        0.766
##   186    154       1   0.6989 0.03056        0.6416        0.761
##   189    152       1   0.6943 0.03070        0.6367        0.757
##   194    149       1   0.6897 0.03085        0.6318        0.753
##   197    147       1   0.6850 0.03099        0.6269        0.749
##   199    145       1   0.6803 0.03113        0.6219        0.744
##   201    144       2   0.6708 0.03141        0.6120        0.735
##   202    142       1   0.6661 0.03154        0.6071        0.731
##   207    139       1   0.6613 0.03168        0.6020        0.726
##   208    138       1   0.6565 0.03181        0.5970        0.722
##   210    137       1   0.6517 0.03194        0.5920        0.717
##   212    135       1   0.6469 0.03206        0.5870        0.713
##   218    134       1   0.6421 0.03218        0.5820        0.708
##   222    132       1   0.6372 0.03231        0.5769        0.704
##   223    130       1   0.6323 0.03243        0.5718        0.699
```

```
##   226    126        1   0.6273 0.03256       0.5666       0.694
##   229    125        1   0.6223 0.03268       0.5614       0.690
##   230    124        1   0.6172 0.03280       0.5562       0.685
##   239    121        2   0.6070 0.03304       0.5456       0.675
##   245    117        1   0.6019 0.03316       0.5402       0.670
##   246    116        1   0.5967 0.03328       0.5349       0.666
##   267    112        1   0.5913 0.03341       0.5294       0.661
##   268    111        1   0.5860 0.03353       0.5239       0.656
##   269    110        1   0.5807 0.03364       0.5184       0.651
##   270    108        1   0.5753 0.03376       0.5128       0.645
##   283    104        1   0.5698 0.03388       0.5071       0.640
##   284    103        1   0.5642 0.03400       0.5014       0.635
##   285    101        2   0.5531 0.03424       0.4899       0.624
##   286     99        1   0.5475 0.03434       0.4841       0.619
##   288     98        1   0.5419 0.03444       0.4784       0.614
##   291     97        1   0.5363 0.03454       0.4727       0.608
##   293     94        1   0.5306 0.03464       0.4669       0.603
##   301     91        1   0.5248 0.03475       0.4609       0.597
##   303     89        1   0.5189 0.03485       0.4549       0.592
##   305     87        1   0.5129 0.03496       0.4488       0.586
##   306     86        1   0.5070 0.03506       0.4427       0.581
##   310     85        2   0.4950 0.03523       0.4306       0.569
##   320     82        1   0.4890 0.03532       0.4244       0.563
##   329     81        1   0.4830 0.03539       0.4183       0.558
##   337     79        1   0.4768 0.03547       0.4121       0.552
##   340     78        1   0.4707 0.03554       0.4060       0.546
##   345     77        1   0.4646 0.03560       0.3998       0.540
##   348     76        1   0.4585 0.03565       0.3937       0.534
##   350     75        1   0.4524 0.03569       0.3876       0.528
##   351     74        1   0.4463 0.03573       0.3815       0.522
##   353     73        2   0.4340 0.03578       0.3693       0.510
##   361     70        1   0.4278 0.03581       0.3631       0.504
##   363     69        2   0.4154 0.03583       0.3508       0.492
##   364     67        1   0.4092 0.03582       0.3447       0.486
##   371     65        2   0.3966 0.03581       0.3323       0.473
##   387     60        1   0.3900 0.03582       0.3258       0.467
##   390     59        1   0.3834 0.03582       0.3193       0.460
##   394     58        1   0.3768 0.03580       0.3128       0.454
##   426     55        1   0.3700 0.03580       0.3060       0.447
##   428     54        1   0.3631 0.03579       0.2993       0.440
##   429     53        1   0.3563 0.03576       0.2926       0.434
##   433     52        1   0.3494 0.03573       0.2860       0.427
##   442     51        1   0.3426 0.03568       0.2793       0.420
##   444     50        1   0.3357 0.03561       0.2727       0.413
##   450     48        1   0.3287 0.03555       0.2659       0.406
##   455     47        1   0.3217 0.03548       0.2592       0.399
##   457     46        1   0.3147 0.03539       0.2525       0.392
##   460     44        1   0.3076 0.03530       0.2456       0.385
##   473     43        1   0.3004 0.03520       0.2388       0.378
##   477     42        1   0.2933 0.03508       0.2320       0.371
```

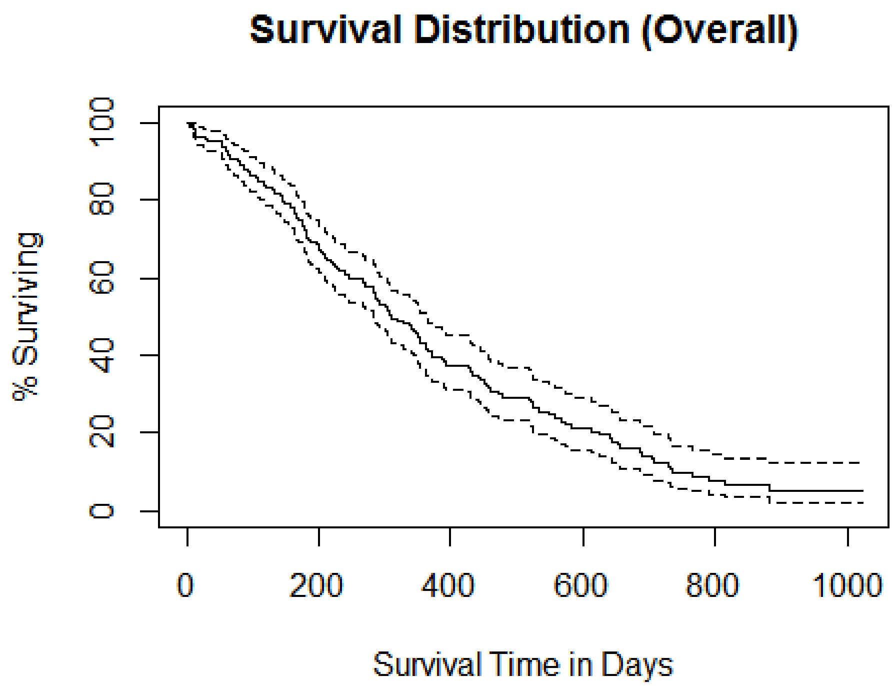
```
##   519      39        1   0.2857 0.03498       0.2248        0.363
##   520      38        1   0.2782 0.03485       0.2177        0.356
##   524      37        2   0.2632 0.03455       0.2035        0.340
##   533      34        1   0.2554 0.03439       0.1962        0.333
##   550      32        1   0.2475 0.03423       0.1887        0.325
##   558      30        1   0.2392 0.03407       0.1810        0.316
##   567      28        1   0.2307 0.03391       0.1729        0.308
##   574      27        1   0.2221 0.03371       0.1650        0.299
##   583      26        1   0.2136 0.03348       0.1571        0.290
##   613      24        1   0.2047 0.03325       0.1489        0.281
##   624      23        1   0.1958 0.03297       0.1407        0.272
##   641      22        1   0.1869 0.03265       0.1327        0.263
##   643      21        1   0.1780 0.03229       0.1247        0.254
##   654      20        1   0.1691 0.03188       0.1169        0.245
##   655      19        1   0.1602 0.03142       0.1091        0.235
##   687      18        1   0.1513 0.03090       0.1014        0.226
##   689      17        1   0.1424 0.03034       0.0938        0.216
##   705      16        1   0.1335 0.02972       0.0863        0.207
##   707      15        1   0.1246 0.02904       0.0789        0.197
##   728      14        1   0.1157 0.02830       0.0716        0.187
##   731      13        1   0.1068 0.02749       0.0645        0.177
##   735      12        1   0.0979 0.02660       0.0575        0.167
##   765      10        1   0.0881 0.02568       0.0498        0.156
##   791       9        1   0.0783 0.02462       0.0423        0.145
##   814       7        1   0.0671 0.02351       0.0338        0.133
##   883       4        1   0.0503 0.02285       0.0207        0.123
```

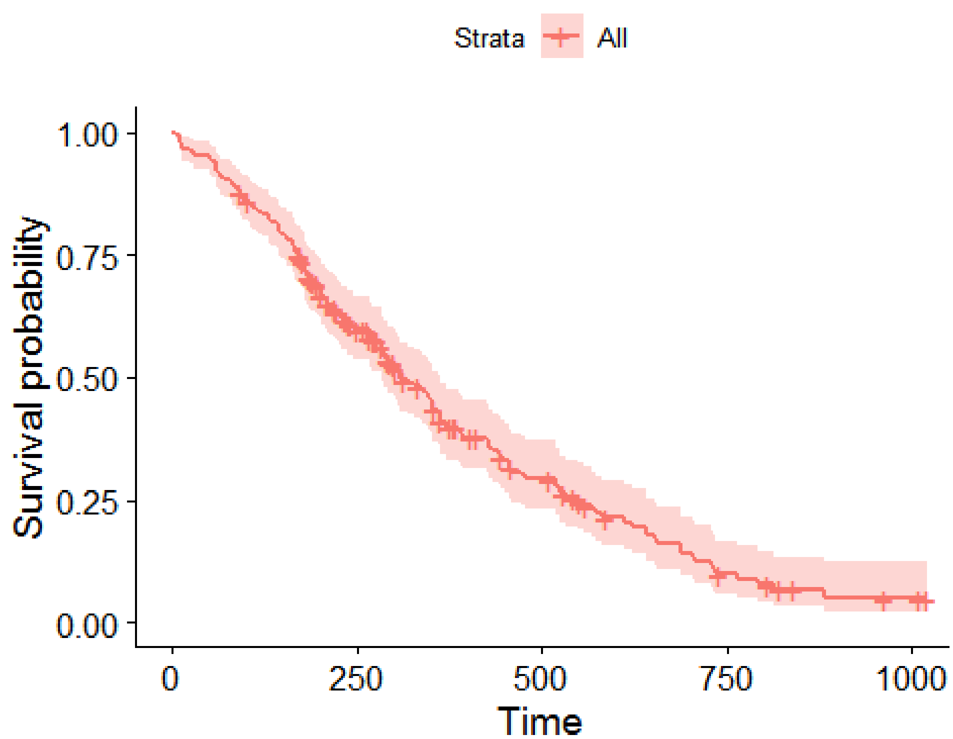
For monthly survival analysis:

```
summary(fit0,times = seq(0,1000,30))

## Call: survfit(formula = survobj ~ 1, data = lung)
##
##  time n.risk n.event survival std.err lower 95% CI upper 95% CI
##     0    228       0   1.0000  0.0000       1.0000        1.000
##    30    219      10   0.9561  0.0136       0.9299        0.983
##    60    213       7   0.9254  0.0174       0.8920        0.960
##    90    201      10   0.8816  0.0214       0.8406        0.925
##   120    189      10   0.8374  0.0245       0.7908        0.887
##   150    179      10   0.7931  0.0269       0.7421        0.848
##   180    160      16   0.7217  0.0298       0.6655        0.783
##   210    137      15   0.6517  0.0319       0.5920        0.717
##   240    119       9   0.6070  0.0330       0.5456        0.675
##   270    108       6   0.5753  0.0338       0.5128        0.645
##   300     92       8   0.5306  0.0346       0.4669        0.603
##   330     80       8   0.4830  0.0354       0.4183        0.558
##   360     70       8   0.4340  0.0358       0.3693        0.510
##   390     59       8   0.3834  0.0358       0.3193        0.460
##   420     55       1   0.3768  0.0358       0.3128        0.454
##   450     48       7   0.3287  0.0356       0.2659        0.406
```

```
## 480 41 5 0.2933 0.0351 0.2320 0.371
## 510 41 0 0.2933 0.0351 0.2320 0.371
## 540 33 5 0.2554 0.0344 0.1962 0.333
## 570 27 3 0.2307 0.0339 0.1729 0.308
## 600 24 2 0.2136 0.0335 0.1571 0.290
## 630 22 2 0.1958 0.0330 0.1407 0.272
## 660 18 4 0.1602 0.0314 0.1091 0.235
## 690 16 2 0.1424 0.0303 0.0938 0.216
## 720 14 2 0.1246 0.0290 0.0789 0.197
## 750 10 3 0.0979 0.0266 0.0575 0.167
## 780 9 1 0.0881 0.0257 0.0498 0.156
## 810 7 1 0.0783 0.0246 0.0423 0.145
## 840 5 1 0.0671 0.0235 0.0338 0.133
## 870 4 0 0.0671 0.0235 0.0338 0.133
## 900 3 1 0.0503 0.0228 0.0207 0.123
## 930 3 0 0.0503 0.0228 0.0207 0.123
## 960 3 0 0.0503 0.0228 0.0207 0.123
## 990 2 0 0.0503 0.0228 0.0207 0.123
```

```r
plot(fit0,xlab="Survival Time in Days",ylab="% Surviving",yscale=100,main="Survival Distribution (Overall)")

ggsurvplot(fit0)
```





For survival

Analysis between males and females

```
fit1<-survfit(survobj~sex,data = lung)
summary(fit1)
```

```
## Call: survfit(formula = survobj ~ sex, data = lung)
##
##                 sex=1
##  time n.risk n.event survival std.err lower 95% CI upper 95% CI
##    11    138       3   0.9783  0.0124       0.9542        1.000
##    12    135       1   0.9710  0.0143       0.9434        0.999
##    13    134       2   0.9565  0.0174       0.9231        0.991
##    15    132       1   0.9493  0.0187       0.9134        0.987
##    26    131       1   0.9420  0.0199       0.9038        0.982
##    30    130       1   0.9348  0.0210       0.8945        0.977
##    31    129       1   0.9275  0.0221       0.8853        0.972
##    53    128       2   0.9130  0.0240       0.8672        0.961
##    54    126       1   0.9058  0.0249       0.8583        0.956
##    59    125       1   0.8986  0.0257       0.8496        0.950
##    60    124       1   0.8913  0.0265       0.8409        0.945
##    65    123       2   0.8768  0.0280       0.8237        0.933
##    71    121       1   0.8696  0.0287       0.8152        0.928
##    81    120       1   0.8623  0.0293       0.8067        0.922
##    88    119       2   0.8478  0.0306       0.7900        0.910
##    92    117       1   0.8406  0.0312       0.7817        0.904
##    93    116       1   0.8333  0.0317       0.7734        0.898
##    95    115       1   0.8261  0.0323       0.7652        0.892
##   105    114       1   0.8188  0.0328       0.7570        0.886
##   107    113       1   0.8116  0.0333       0.7489        0.880
##   110    112       1   0.8043  0.0338       0.7408        0.873
##   116    111       1   0.7971  0.0342       0.7328        0.867
##   118    110       1   0.7899  0.0347       0.7247        0.861
##   131    109       1   0.7826  0.0351       0.7167        0.855
##   132    108       2   0.7681  0.0359       0.7008        0.842
##   135    106       1   0.7609  0.0363       0.6929        0.835
##   142    105       1   0.7536  0.0367       0.6851        0.829
##   144    104       1   0.7464  0.0370       0.6772        0.823
##   147    103       1   0.7391  0.0374       0.6694        0.816
##   156    102       2   0.7246  0.0380       0.6538        0.803
##   163    100       3   0.7029  0.0389       0.6306        0.783
##   166     97       1   0.6957  0.0392       0.6230        0.777
##   170     96       1   0.6884  0.0394       0.6153        0.770
##   175     94       1   0.6811  0.0397       0.6076        0.763
##   176     93       1   0.6738  0.0399       0.5999        0.757
##   177     92       1   0.6664  0.0402       0.5922        0.750
##   179     91       2   0.6518  0.0406       0.5769        0.736
##   180     89       1   0.6445  0.0408       0.5693        0.730
##   181     88       2   0.6298  0.0412       0.5541        0.716
##   183     86       1   0.6225  0.0413       0.5466        0.709
##   189     83       1   0.6150  0.0415       0.5388        0.702
```

```
##    197      80         1    0.6073  0.0417        0.5309         0.695
##    202      78         1    0.5995  0.0419        0.5228         0.687
##    207      77         1    0.5917  0.0420        0.5148         0.680
##    210      76         1    0.5839  0.0422        0.5068         0.673
##    212      75         1    0.5762  0.0424        0.4988         0.665
##    218      74         1    0.5684  0.0425        0.4909         0.658
##    222      72         1    0.5605  0.0426        0.4829         0.651
##    223      70         1    0.5525  0.0428        0.4747         0.643
##    229      67         1    0.5442  0.0429        0.4663         0.635
##    230      66         1    0.5360  0.0431        0.4579         0.627
##    239      64         1    0.5276  0.0432        0.4494         0.619
##    246      63         1    0.5192  0.0433        0.4409         0.611
##    267      61         1    0.5107  0.0434        0.4323         0.603
##    269      60         1    0.5022  0.0435        0.4238         0.595
##    270      59         1    0.4937  0.0436        0.4152         0.587
##    283      57         1    0.4850  0.0437        0.4065         0.579
##    284      56         1    0.4764  0.0438        0.3979         0.570
##    285      54         1    0.4676  0.0438        0.3891         0.562
##    286      53         1    0.4587  0.0439        0.3803         0.553
##    288      52         1    0.4499  0.0439        0.3716         0.545
##    291      51         1    0.4411  0.0439        0.3629         0.536
##    301      48         1    0.4319  0.0440        0.3538         0.527
##    303      46         1    0.4225  0.0440        0.3445         0.518
##    306      44         1    0.4129  0.0440        0.3350         0.509
##    310      43         1    0.4033  0.0441        0.3256         0.500
##    320      42         1    0.3937  0.0440        0.3162         0.490
##    329      41         1    0.3841  0.0440        0.3069         0.481
##    337      40         1    0.3745  0.0439        0.2976         0.471
##    353      39         2    0.3553  0.0437        0.2791         0.452
##    363      37         1    0.3457  0.0436        0.2700         0.443
##    364      36         1    0.3361  0.0434        0.2609         0.433
##    371      35         1    0.3265  0.0432        0.2519         0.423
##    387      34         1    0.3169  0.0430        0.2429         0.413
##    390      33         1    0.3073  0.0428        0.2339         0.404
##    394      32         1    0.2977  0.0425        0.2250         0.394
##    428      29         1    0.2874  0.0423        0.2155         0.383
##    429      28         1    0.2771  0.0420        0.2060         0.373
##    442      27         1    0.2669  0.0417        0.1965         0.362
##    455      25         1    0.2562  0.0413        0.1868         0.351
##    457      24         1    0.2455  0.0410        0.1770         0.341
##    460      22         1    0.2344  0.0406        0.1669         0.329
##    477      21         1    0.2232  0.0402        0.1569         0.318
##    519      20         1    0.2121  0.0397        0.1469         0.306
##    524      19         1    0.2009  0.0391        0.1371         0.294
##    533      18         1    0.1897  0.0385        0.1275         0.282
##    558      17         1    0.1786  0.0378        0.1179         0.270
##    567      16         1    0.1674  0.0371        0.1085         0.258
##    574      15         1    0.1562  0.0362        0.0992         0.246
##    583      14         1    0.1451  0.0353        0.0900         0.234
##    613      13         1    0.1339  0.0343        0.0810         0.221
```

```
##   624     12       1   0.1228  0.0332       0.0722        0.209
##   643     11       1   0.1116  0.0320       0.0636        0.196
##   655     10       1   0.1004  0.0307       0.0552        0.183
##   689      9       1   0.0893  0.0293       0.0470        0.170
##   707      8       1   0.0781  0.0276       0.0390        0.156
##   791      7       1   0.0670  0.0259       0.0314        0.143
##   814      5       1   0.0536  0.0239       0.0223        0.128
##   883      3       1   0.0357  0.0216       0.0109        0.117
## 
##                 sex=2 
##  time n.risk n.event survival std.err lower 95% CI upper 95% CI
##     5     90       1   0.9889  0.0110       0.9675        1.000
##    60     89       1   0.9778  0.0155       0.9478        1.000
##    61     88       1   0.9667  0.0189       0.9303        1.000
##    62     87       1   0.9556  0.0217       0.9139        0.999
##    79     86       1   0.9444  0.0241       0.8983        0.993
##    81     85       1   0.9333  0.0263       0.8832        0.986
##    95     83       1   0.9221  0.0283       0.8683        0.979
##   107     81       1   0.9107  0.0301       0.8535        0.972
##   122     80       1   0.8993  0.0318       0.8390        0.964
##   145     79       2   0.8766  0.0349       0.8108        0.948
##   153     77       1   0.8652  0.0362       0.7970        0.939
##   166     76       1   0.8538  0.0375       0.7834        0.931
##   167     75       1   0.8424  0.0387       0.7699        0.922
##   182     71       1   0.8305  0.0399       0.7559        0.913
##   186     70       1   0.8187  0.0411       0.7420        0.903
##   194     68       1   0.8066  0.0422       0.7280        0.894
##   199     67       1   0.7946  0.0432       0.7142        0.884
##   201     66       2   0.7705  0.0452       0.6869        0.864
##   208     62       1   0.7581  0.0461       0.6729        0.854
##   226     59       1   0.7452  0.0471       0.6584        0.843
##   239     57       1   0.7322  0.0480       0.6438        0.833
##   245     54       1   0.7186  0.0490       0.6287        0.821
##   268     51       1   0.7045  0.0501       0.6129        0.810
##   285     47       1   0.6895  0.0512       0.5962        0.798
##   293     45       1   0.6742  0.0523       0.5791        0.785
##   305     43       1   0.6585  0.0534       0.5618        0.772
##   310     42       1   0.6428  0.0544       0.5447        0.759
##   340     39       1   0.6264  0.0554       0.5267        0.745
##   345     38       1   0.6099  0.0563       0.5089        0.731
##   348     37       1   0.5934  0.0572       0.4913        0.717
##   350     36       1   0.5769  0.0579       0.4739        0.702
##   351     35       1   0.5604  0.0586       0.4566        0.688
##   361     33       1   0.5434  0.0592       0.4390        0.673
##   363     32       1   0.5265  0.0597       0.4215        0.658
##   371     30       1   0.5089  0.0603       0.4035        0.642
##   426     26       1   0.4893  0.0610       0.3832        0.625
##   433     25       1   0.4698  0.0617       0.3632        0.608
##   444     24       1   0.4502  0.0621       0.3435        0.590
##   450     23       1   0.4306  0.0624       0.3241        0.572
```

```
##   473      22        1   0.4110  0.0626       0.3050         0.554
##   520      19        1   0.3894  0.0629       0.2837         0.534
##   524      18        1   0.3678  0.0630       0.2628         0.515
##   550      15        1   0.3433  0.0634       0.2390         0.493
##   641      11        1   0.3121  0.0649       0.2076         0.469
##   654      10        1   0.2808  0.0655       0.1778         0.443
##   687       9        1   0.2496  0.0652       0.1496         0.417
##   705       8        1   0.2184  0.0641       0.1229         0.388
##   728       7        1   0.1872  0.0621       0.0978         0.359
##   731       6        1   0.1560  0.0590       0.0743         0.328
##   735       5        1   0.1248  0.0549       0.0527         0.295
##   765       3        1   0.0832  0.0499       0.0257         0.270
```

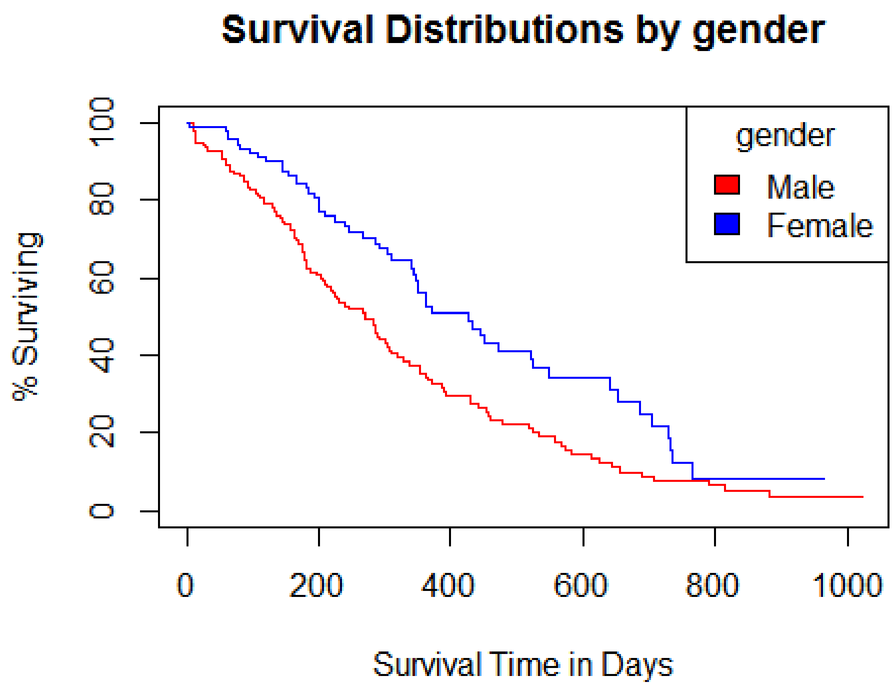
monthly

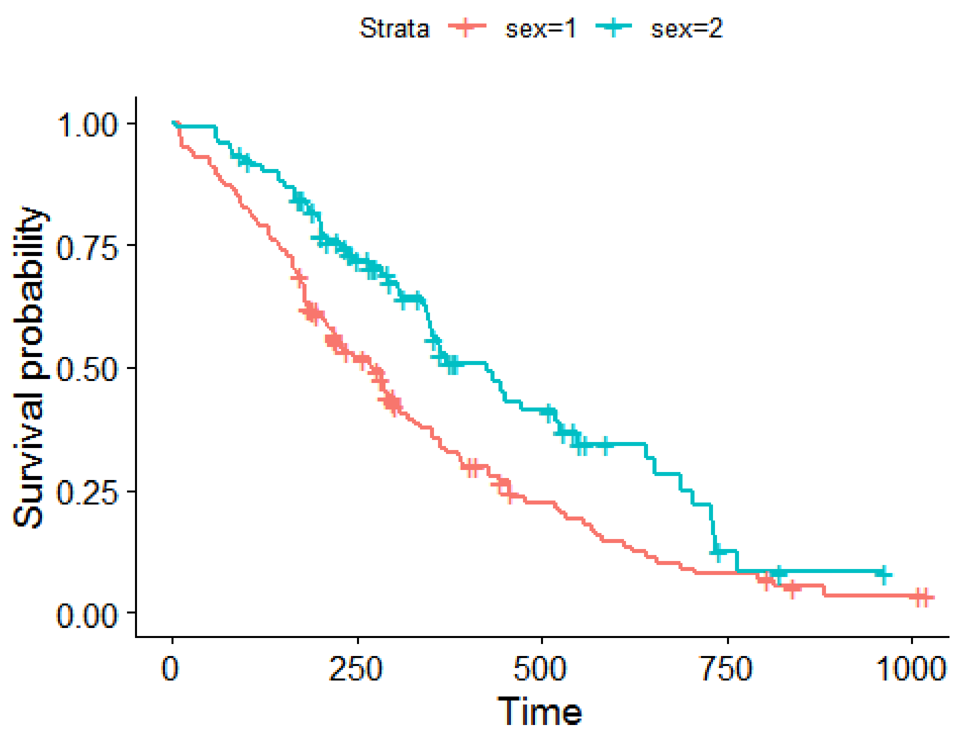
```
summary(fit1,times = seq(0,1000,30))
```

```
## Call: survfit(formula = survobj ~ sex, data = lung)
##
##                 sex=1
##  time n.risk n.event survival std.err lower 95% CI upper 95% CI
##     0    138       0   1.0000  0.0000       1.0000         1.000
##    30    130       9   0.9348  0.0210       0.8945         0.977
##    60    124       6   0.8913  0.0265       0.8409         0.945
##    90    117       6   0.8478  0.0306       0.7900         0.910
##   120    109       8   0.7899  0.0347       0.7247         0.861
##   150    102       7   0.7391  0.0374       0.6694         0.816
##   180     89      13   0.6445  0.0408       0.5693         0.730
##   210     76       8   0.5839  0.0422       0.5068         0.673
##   240     63       7   0.5276  0.0432       0.4494         0.619
##   270     59       4   0.4937  0.0436       0.4152         0.587
##   300     49       6   0.4411  0.0439       0.3629         0.536
##   330     40       6   0.3841  0.0440       0.3069         0.481
##   360     37       3   0.3553  0.0437       0.2791         0.452
##   390     33       5   0.3073  0.0428       0.2339         0.404
##   420     29       1   0.2977  0.0425       0.2250         0.394
##   450     25       3   0.2669  0.0417       0.1965         0.362
##   480     20       4   0.2232  0.0402       0.1569         0.318
##   510     20       0   0.2232  0.0402       0.1569         0.318
##   540     17       3   0.1897  0.0385       0.1275         0.282
##   570     15       2   0.1674  0.0371       0.1085         0.258
##   600     13       2   0.1451  0.0353       0.0900         0.234
##   630     11       2   0.1228  0.0332       0.0722         0.209
##   660      9       2   0.1004  0.0307       0.0552         0.183
##   690      8       1   0.0893  0.0293       0.0470         0.170
##   720      7       1   0.0781  0.0276       0.0390         0.156
##   750      7       0   0.0781  0.0276       0.0390         0.156
##   780      7       0   0.0781  0.0276       0.0390         0.156
##   810      5       1   0.0670  0.0259       0.0314         0.143
##   840      4       1   0.0536  0.0239       0.0223         0.128
```

```
##   870      3       0   0.0536  0.0239       0.0223        0.128
##   900      2       1   0.0357  0.0216       0.0109        0.117
##   930      2       0   0.0357  0.0216       0.0109        0.117
##   960      2       0   0.0357  0.0216       0.0109        0.117
##   990      2       0   0.0357  0.0216       0.0109        0.117
## 
##                 sex=2 
##  time n.risk n.event survival std.err lower 95% CI upper 95% CI
##     0     90       0   1.0000  0.0000       1.0000        1.000
##    30     89       1   0.9889  0.0110       0.9675        1.000
##    60     89       1   0.9778  0.0155       0.9478        1.000
##    90     84       4   0.9333  0.0263       0.8832        0.986
##   120     80       2   0.9107  0.0301       0.8535        0.972
##   150     77       3   0.8766  0.0349       0.8108        0.948
##   180     71       3   0.8424  0.0387       0.7699        0.922
##   210     61       7   0.7581  0.0461       0.6729        0.854
##   240     56       2   0.7322  0.0480       0.6438        0.833
##   270     49       2   0.7045  0.0501       0.6129        0.810
##   300     43       2   0.6742  0.0523       0.5791        0.785
##   330     40       2   0.6428  0.0544       0.5447        0.759
##   360     33       5   0.5604  0.0586       0.4566        0.688
##   390     26       3   0.5089  0.0603       0.4035        0.642
##   420     26       0   0.5089  0.0603       0.4035        0.642
##   450     23       4   0.4306  0.0624       0.3241        0.572
##   480     21       1   0.4110  0.0626       0.3050        0.554
##   510     21       0   0.4110  0.0626       0.3050        0.554
##   540     16       2   0.3678  0.0630       0.2628        0.515
##   570     12       1   0.3433  0.0634       0.2390        0.493
##   600     11       0   0.3433  0.0634       0.2390        0.493
##   630     11       0   0.3433  0.0634       0.2390        0.493
##   660      9       2   0.2808  0.0655       0.1778        0.443
##   690      8       1   0.2496  0.0652       0.1496        0.417
##   720      7       1   0.2184  0.0641       0.1229        0.388
##   750      3       3   0.1248  0.0549       0.0527        0.295
##   780      2       1   0.0832  0.0499       0.0257        0.270
##   810      2       0   0.0832  0.0499       0.0257        0.270
##   840      1       0   0.0832  0.0499       0.0257        0.270
##   870      1       0   0.0832  0.0499       0.0257        0.270
##   900      1       0   0.0832  0.0499       0.0257        0.270
##   930      1       0   0.0832  0.0499       0.0257        0.270
##   960      1       0   0.0832  0.0499       0.0257        0.270
```

```
plot(fit1,xlab="Survival Time in Days",ylab="%
Surviving",yscale=100,col=c("red","blue"),main="Survival Distributions by
gender")
legend("topright",title="gender",c("Male","Female"),fill = c("red","blue"))
ggsurvplot(fit1)
```






```
fit1

## Call: survfit(formula = survobj ~ sex, data = lung)
##
```

```
##         n events median 0.95LCL 0.95UCL
## sex=1 138    112    270     212     310
## sex=2  90     53    426     348     550
```

Notice that CI showing no overlapping

Test for difference between male and female survival curves (logrank test)

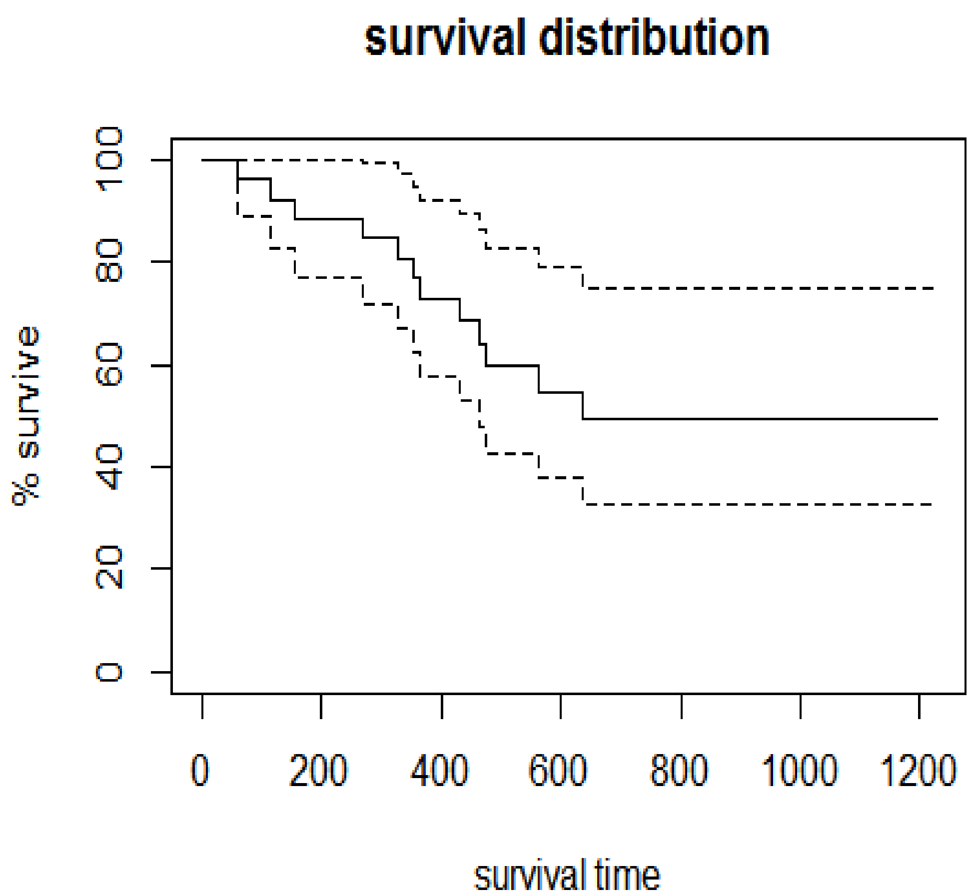
```
survdiff(survobj~sex,data = lung)

## Call:
## survdiff(formula = survobj ~ sex, data = lung)
##
##         N Observed Expected (O-E)^2/E (O-E)^2/V
## sex=1 138      112     91.6      4.55      10.3
## sex=2  90       53     73.4      5.68      10.3
##
##  Chisq= 10.3  on 1 degrees of freedom, p= 0.001
```

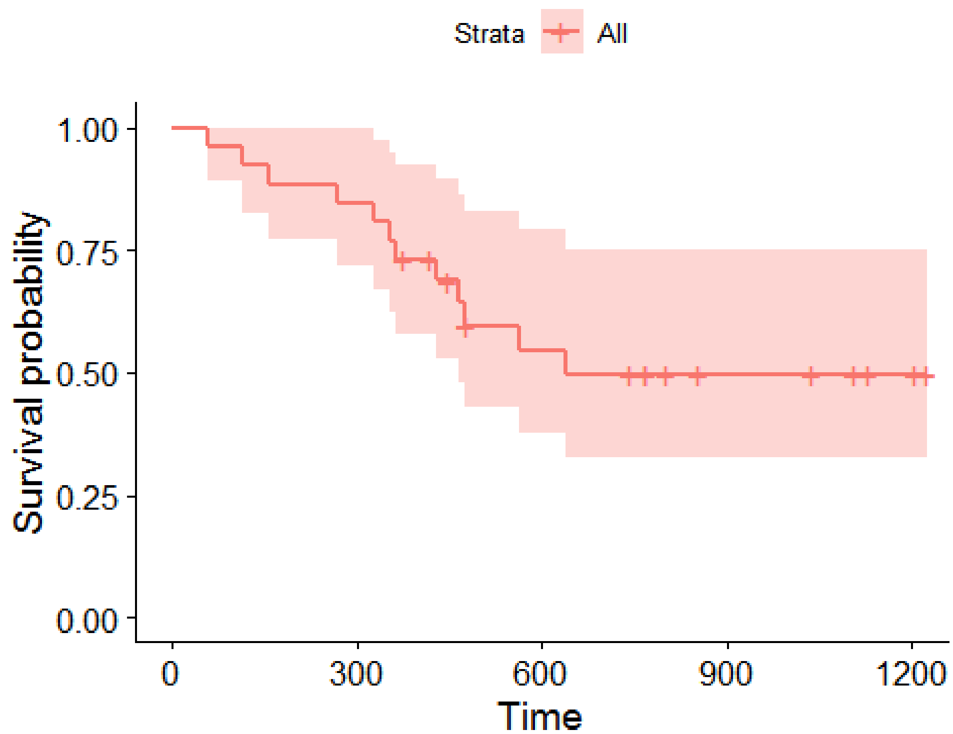
p value = 0.001 which indicating a significant difference between male and female survival time.

Another example on different data:

```
attach(ovarian)

## The following object is masked from lung:
##
##     age

surv<-with(ovarian,Surv(futime,fustat))
fit<- survfit(surv~1,data = ovarian)
summary(fit)

## Call: survfit(formula = surv ~ 1, data = ovarian)
##
##  time n.risk n.event survival std.err lower 95% CI upper 95% CI
##    59     26       1    0.962  0.0377        0.890        1.000
##   115     25       1    0.923  0.0523        0.826        1.000
##   156     24       1    0.885  0.0627        0.770        1.000
##   268     23       1    0.846  0.0708        0.718        0.997
##   329     22       1    0.808  0.0773        0.670        0.974
##   353     21       1    0.769  0.0826        0.623        0.949
##   365     20       1    0.731  0.0870        0.579        0.923
##   431     17       1    0.688  0.0919        0.529        0.894
```

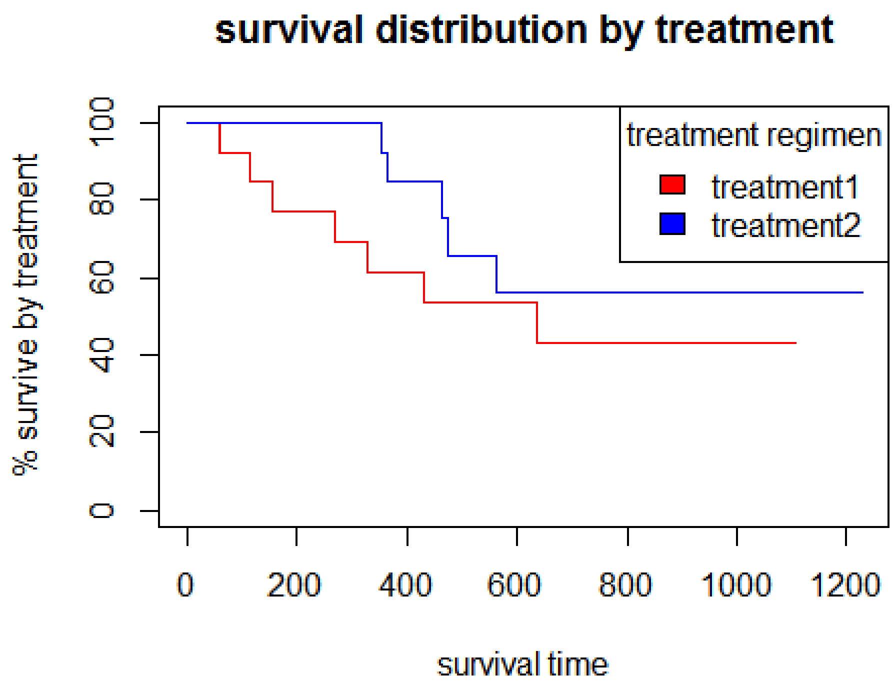
```
##    464      15        1     0.642  0.0965        0.478         0.862
##    475      14        1     0.596  0.0999        0.429         0.828
##    563      12        1     0.546  0.1032        0.377         0.791
##    638      11        1     0.497  0.1051        0.328         0.752

plot(fit,xlab = "survival time" ,ylab = "% survive",yscale =
100,main="survival distribution")
ggsurvplot(fit)
```

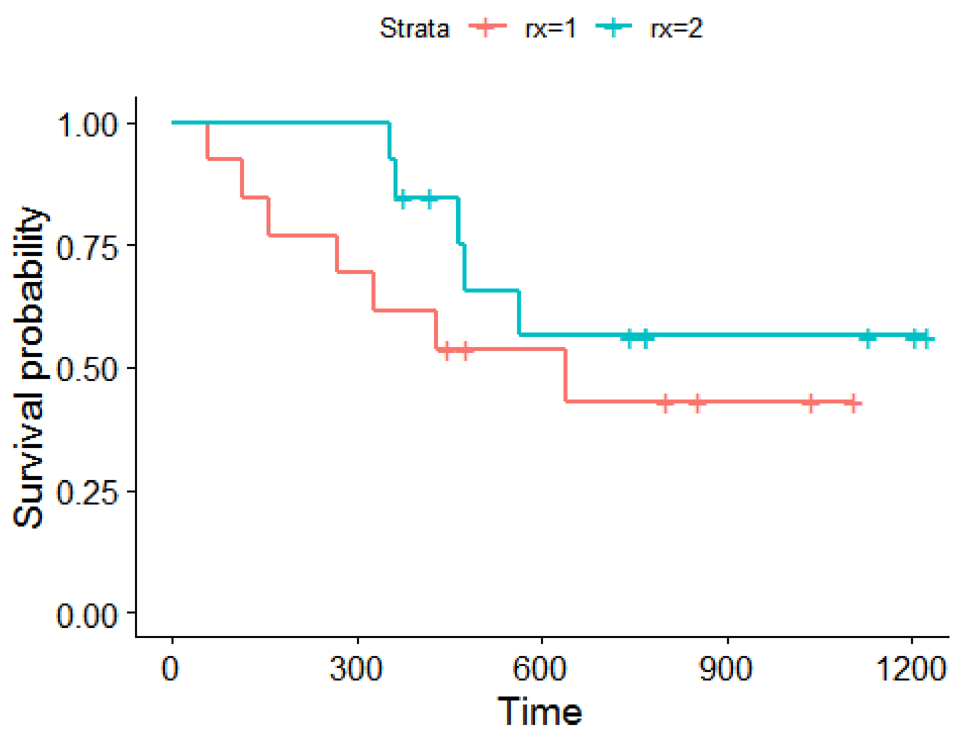




Survival analysis in case of two different treatment regimen

```
fit2<- survfit(surv~rx,data = ovarian)
plot(fit2,xlab = "survival time" ,ylab = "% survive by treatment",yscale =
100,main="survival distribution by treatment",col=c("red","blue"))
legend("topright",title = "treatment regimen",fill =
c("red","blue"),c("treatment1","treatment2"))
ggsurvplot(fit2)
```






```
fit2

## Call: survfit(formula = surv ~ rx, data = ovarian)
##
```

```
##       n events median 0.95LCL 0.95UCL
## rx=1 13      7    638     268      NA
## rx=2 13      5     NA     475      NA
```

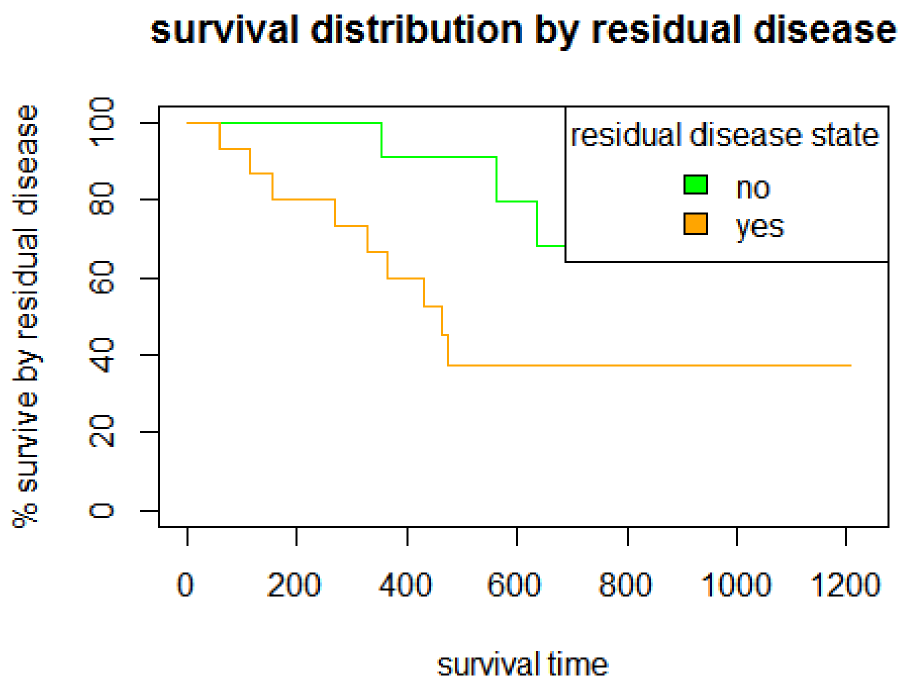
```
survdiff(surv~rx,data = ovarian)
```

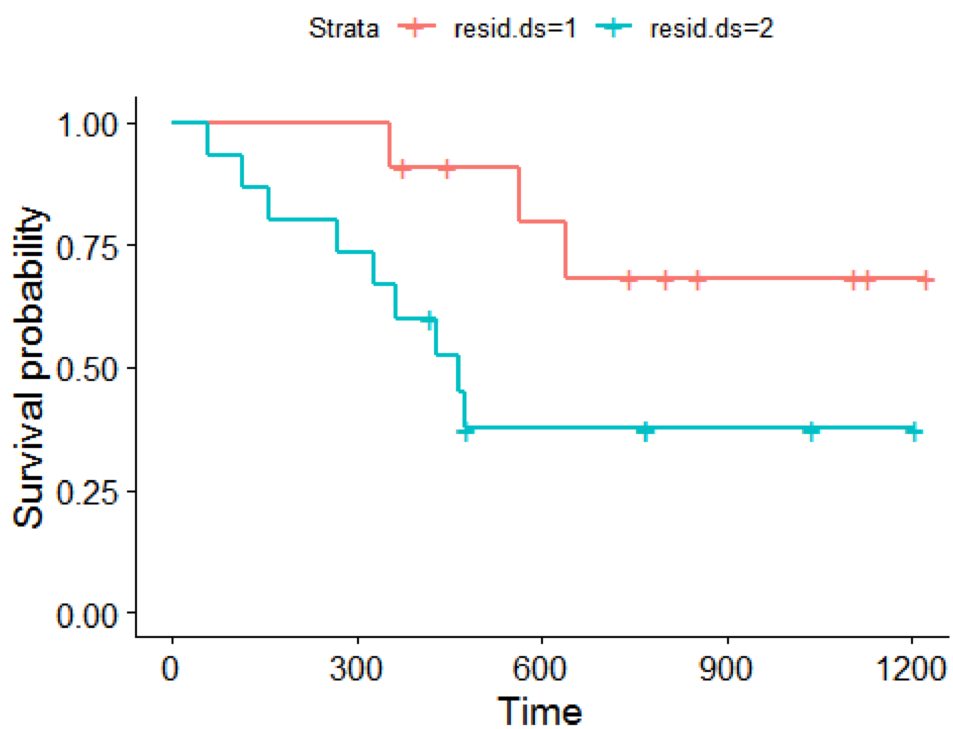
```
## Call:
## survdiff(formula = surv ~ rx, data = ovarian)
##
##       N Observed Expected (O-E)^2/E (O-E)^2/V
## rx=1 13        7     5.23     0.596      1.06
## rx=2 13        5     6.77     0.461      1.06
##
##  Chisq= 1.1  on 1 degrees of freedom, p= 0.3
```

p value =0.3 showing non significant difference between the two treatment groups.

Survival analysing in case of presence of residual disease or not

```
fit3<-survfit(surv~resid.ds,data = ovarian)
plot(fit3,xlab = "survival time",ylab = "% survive by residual disease",
yscale=100,main = "survival distribution by residual
disease",col=c("green","orange"))
legend("topright",title = "residual disease state",c("no","yes"),fill =
c("green","orange"))
ggsurvplot(fit3)
```






```
fit3

## Call: survfit(formula = surv ~ resid.ds, data = ovarian)
##
```

```
##              n events median 0.95LCL 0.95UCL
## resid.ds=1 11      3     NA     638      NA
## resid.ds=2 15      9    464     329      NA
```

```r
survdiff(surv~resid.ds,data = ovarian)
```

```
## Call:
## survdiff(formula = surv ~ resid.ds, data = ovarian)
##
##              N Observed Expected (O-E)^2/E (O-E)^2/V
## resid.ds=1 11        3     6.26      1.70      3.62
## resid.ds=2 15        9     5.74      1.85      3.62
##
##  Chisq= 3.6  on 1 degrees of freedom, p= 0.06
```

p value = 0.06 so there is noo signifcant difference between the presence of a residual disease or not