APTS - Survival Analysis
Lab Session 2 - Solutions

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1.
```
> library("survival")
> library("KMsurv")
> data(burn)

> fit1 = coxph(Surv(T3,D3)~Z1,data=burn)
> summary(fit1)
Call:
coxph(formula = Surv(T3, D3) ~ Z1, data = burn)

  n= 154, number of events= 48

       coef exp(coef) se(coef)      z Pr(>|z|)
Z1 -0.5614    0.5704   0.2934 -1.914   0.0557 .
---
Signif. codes:  0 ?***? 0.001 ?**? 0.01 ?*? 0.05 ?.? 0.1 ? ? 1

   exp(coef) exp(-coef) lower .95 upper .95
Z1    0.5704      1.753     0.321     1.014

Concordance= 0.566  (se = 0.039 )
Rsquare= 0.024   (max possible= 0.942 )
Likelihood ratio test= 3.73  on 1 df,   p=0.05347
Wald test            = 3.66  on 1 df,   p=0.05567
Score (logrank) test = 3.76  on 1 df,   p=0.05256
```

2.
```
> fit2 = coxph(Surv(T3,D3)~Z1+Z4,data=burn)
> summary(fit2)
Call:
coxph(formula = Surv(T3, D3) ~ Z1 + Z4, data = burn)

  n= 154, number of events= 48

        coef exp(coef)  se(coef)      z Pr(>|z|)
Z1 -0.524764  0.591695  0.295769 -1.774    0.076 .
Z4  0.007248  1.007275  0.007145  1.015    0.310
```

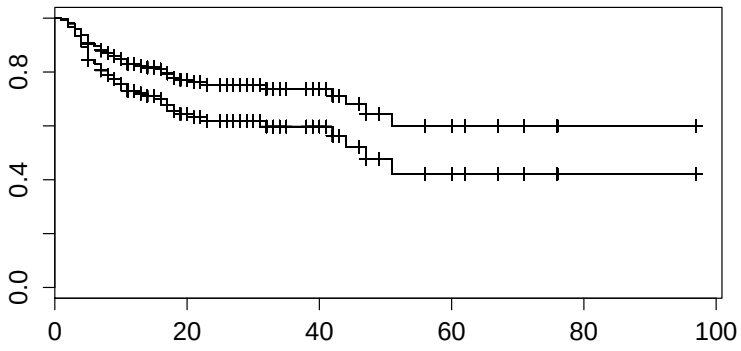
```
---
Signif. codes:  0 ?***? 0.001 ?**? 0.01 ?*? 0.05 ?.? 0.1 ? ? 1

   exp(coef) exp(-coef) lower .95 upper .95
Z1    0.5917     1.6901    0.3314     1.056
Z4    1.0073     0.9928    0.9933     1.021

Concordance= 0.585  (se = 0.046 )
Rsquare= 0.03   (max possible= 0.942 )
Likelihood ratio test= 4.7  on 2 df,   p=0.09551
Wald test            = 4.72  on 2 df,   p=0.09461
Score (logrank) test = 4.82  on 2 df,   p=0.08972

> fit3 = coxph(Surv(T3,D3)~Z4,data=burn)
> summary(fit3)
Call:
coxph(formula = Surv(T3, D3) ~ Z4, data = burn)

  n= 154, number of events= 48

       coef exp(coef) se(coef)    z Pr(>|z|)
Z4 0.008906  1.008946 0.007010 1.27    0.204

   exp(coef) exp(-coef) lower .95 upper .95
Z4     1.009     0.9911    0.9952     1.023

Concordance= 0.552  (se = 0.045 )
Rsquare= 0.01   (max possible= 0.942 )
Likelihood ratio test= 1.49  on 1 df,   p=0.2215
Wald test            = 1.61  on 1 df,   p=0.2039
Score (logrank) test = 1.62  on 1 df,   p=0.2025
```

P-values :

- Wald test : 0.076
- Likelihood ratio test : $T_{LR} = 4.70 - 1.49 = 3.21 \Rightarrow P\text{-value} = 0.073$

```
> 1-pchisq(3.21,1)
[1] 0.07318948
```

3.
```
> fit4 = survfit(fit2,newdata=data.frame(Z1=c(0,1),Z4=25),conf.type="log-log")
> plot(fit4)
```



4.
```
> mat=cbind(fit4$time,fit4$surv,fit4$lower,fit4$upper)
> t20=(fit4$time==20)
> mat[t20,c(2,4,6)]
        1         1         1
0.6442330 0.5166641 0.7461969
> mat[t20,c(3,5,7)]
        2         2         2
0.7709242 0.6632128 0.8480441
```