# Larynx Example

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Using R to recreate an example from class...

The data set is in the KMsurv package, below are the first 12 lines of the data set:

```
# Load data from KMsurv package
data(larynx)
attach(larynx)

# Print first few rows
kable(head(larynx, 12))
```

| stage | time | age | diagyr | delta |
|---|---|---|---|---|
| 1 | 0.6 | 77 | 76 | 1 |
| 1 | 1.3 | 53 | 71 | 1 |
| 1 | 2.4 | 45 | 71 | 1 |
| 1 | 2.5 | 57 | 78 | 0 |
| 1 | 3.2 | 58 | 74 | 1 |
| 1 | 3.2 | 51 | 77 | 0 |
| 1 | 3.3 | 76 | 74 | 1 |
| 1 | 3.3 | 63 | 77 | 0 |
| 1 | 3.5 | 43 | 71 | 1 |
| 1 | 3.5 | 60 | 73 | 1 |
| 1 | 4.0 | 52 | 71 | 1 |
| 1 | 4.0 | 63 | 76 | 1 |

Now we need to fit a Cox PH model with a single covariate, age.

```
cox_model <- coxph(Surv(time = time, event = delta) ~ age); summary(cox_model)
```

```
## Call:
## coxph(formula = Surv(time = time, event = delta) ~ age)
##
##   n= 90, number of events= 50
##
##        coef exp(coef) se(coef)     z Pr(>|z|)
## age 0.02328   1.02356  0.01449 1.607    0.108
##
##     exp(coef) exp(-coef) lower .95 upper .95
## age     1.024      0.977    0.9949     1.053
##
## Concordance= 0.555  (se = 0.045 )
## Rsquare= 0.029   (max possible= 0.987 )
## Likelihood ratio test= 2.63  on 1 df,   p=0.1048
## Wald test            = 2.58  on 1 df,   p=0.108
## Score (logrank) test = 2.6  on 1 df,   p=0.1069
```

As in class, the coefficient for age is 0.023.

***log-likelihood (partial) = -195.906 ?***

Full model:

```
cox_model2 <- coxph(Surv(time = time, event = delta) ~ as.factor(stage) + age)
summary(cox_model2)
```

```
## Call:
## coxph(formula = Surv(time = time, event = delta) ~ as.factor(stage) +
##     age)
##
##   n= 90, number of events= 50
##
##                       coef exp(coef) se(coef)     z Pr(>|z|)
## as.factor(stage)2 0.14004   1.15032  0.46249 0.303   0.7620
## as.factor(stage)3 0.64238   1.90100  0.35611 1.804   0.0712 .
## as.factor(stage)4 1.70598   5.50678  0.42191 4.043 5.27e-05 ***
## age               0.01903   1.01921  0.01426 1.335   0.1820
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##                   exp(coef) exp(-coef) lower .95 upper .95
## as.factor(stage)2     1.150     0.8693    0.4647     2.848
## as.factor(stage)3     1.901     0.5260    0.9459     3.820
## as.factor(stage)4     5.507     0.1816    2.4086    12.590
## age                   1.019     0.9811    0.9911     1.048
##
## Concordance= 0.682  (se = 0.045 )
## Rsquare= 0.184   (max possible= 0.987 )
## Likelihood ratio test= 18.31  on 4 df,   p=0.001072
## Wald test            = 21.15  on 4 df,   p=0.0002958
## Score (logrank) test = 24.78  on 4 df,   p=5.573e-05
```