Problem Set 4

Applied Stats II

Due: April 12, 2024

Instructions

- Please show your work! You may lose points by simply writing in the answer. If the problem requires you to execute commands in `R`, please include the code you used to get your answers. Please also include the `.R` file that contains your code. If you are not sure if work needs to be shown for a particular problem, please ask.

- Your homework should be submitted electronically on GitHub in `.pdf` form.

- This problem set is due before 23:59 on Friday April 12, 2024. No late assignments will be accepted.

Question 1

We're interested in modeling the historical causes of child mortality. We have data from 26855 children born in Skellefteå, Sweden from 1850 to 1884. Using the "child" dataset in the `eha` library, fit a Cox Proportional Hazard model using mother's age and infant's gender as covariates. Present and interpret the output.

```
data("child", package = "eha")
# turning "sex" into factor
child$sex <- as.factor(child$sex)
#fotting the model
cph_model <- coxph(Surv(exit, event) ~ m.age + sex, data = child)
#
summary(cph_model)
```

```
OUTPUT
Call:
coxph(formula = Surv(exit, event) ~ m.age + sex, data = child)
n= 26574, number of events= 5616
                coef    exp(coef)   se(coef)      z    Pr(>|z|)
m.age         0.007617   1.007646   0.002128   3.580  0.000344 ***
sexfemale    -0.082215   0.921074   0.026743  -3.074  0.002110 **
Signif. codes:  0 *** 0.001 ** 0.01 * 0.05 . 0.1    1
```

```
 9                 exp(coef) exp(-coef) lower .95 upper .95
10 m.age              1.0076       0.9924        1.003      1.0119
11 sexfemale          0.9211       1.0857        0.874      0.9706
12 Concordance= 0.519   (se = 0.004 )
13 Likelihood ratio test= 22.52   on 2 df,       p=1e-05
14 Wald test              = 22.52   on 2 df,       p=1e-05
15 Score (logrank) test = 22.53   on 2 df,       p=1e-05
```

The estimated coefficient for mother's age indicates the log hazard ratio associated with a one unit increase in mother's age. The exp(coef) is the hazard ratio associated with one year increase in mothers age, it suggests that a one unit increase in mothers age is associated with a **0.76** per cent increase in the risk of the event(death). The p value suggests that the coefficient for m.age is significant. The estimated coefficient for female sex indicates that being female is associated with a decrease in the log hazard ratio compared to being male that is the reference category. The exp(coef) of the hazard ratio suggests that female children have a **7.89** per cent lower risk of the event compared to male children. The p value for sexfemale suggests that this coefficient is also significant.